RAILROAD GAZETTE

FRIDAY, FEBRUARY 2, 1900.

CONTENTS.

ILLUSTRATIONS:	PAGE
The South Terminal Station at Boston	66
New Air Brake Instruction Car	67
Locomotive Frame Slotting Machine	67
The Transportation of Long Girders	69
Monarch No. 4 Piston Air Drill	70
An Automatic Recorder of Emergency Brake Appliances	71
CONTRIBUTIONS:	
Economical Freight Train Speed	65
EDITORIALS:	
On Certain Terminal Stations	72
December Accidents	72
EDITORIAL NOTES	72, 73
New Publications	73
Trade Catalogues	73
GENERAL NEWS:	
Locomotive Building	76
Car Building	77
Bridge Building	77

GENERAL NEWS:	PAGE
Meetings and Announcements	78
Personal	78
Elections and Appointments	79
Railroad Construction	79
General Railroad News	80
MISCELLANEOUS:	
Technical	75
The Scrap Heap	75
Closing the Slot in M. C. B. Knuckles	65
Packing Journal Boxes	67
Northwestern Electrical Association	68
Pinsch Gas on the New York Central	68
The Canals of the State of New York	69
Report of the New York Commerce Commission	70
The Production and Use of Gas for Power	70
Locomotive Fuel Accounts	70
Foreign Railroad Notes	71
Grade Crossings	74
Train Accidents in the United States in December	74

Contributions.

Economical Freight Train Speeds.

Athens, Pa., Jan. 26, 1900.

To the Editor of the Railroad Gazette:

I was very much interested in your editorial of Jan. 12 on the "Economical Freight Train Speed," as it coincided exactly with the results of my observation. To this one rule, as much as any one thing, is due, in my opinion, the splendid results, financial and physical, of the management of the Boston & Albany Railroad. As a bridge inspector of this corporation for the last four years, I have had abundant opportunity to observe the movement of freight trains, and it is my conviction that this company has adopted the only safe and economical method of conducting freight transportation over its system with its numerous grades and curves. Numberless small accidents that never get into the papers, and which railroad men only hear about (which are often unavoidable with the best of supervision) show me that high speed for freight trains is not safe or economical. Ordinary freight trains are limited in speed to 15 miles an hour on the Boston & Albany. This might perhaps safely be raised now to 20 or more miles an hour, in view of the general adoption of air brakes and better and heavier equipment.

WALTER I. SWANTON.

To the Editor the Railroad Gazette:

Since reading Mr. Kendrick's somewhat remarkable statement of the most important problem before American railroad managers, I have given the matter considerable thought, and have endeavored from such performance records as I have, and from theoretical considerations, to work out an expression for the most economical speed, considering the several items of wages, usefully used fuel, lost fuel, and maintenance expenses.

Thus far I have not succeeded in forming any definite mathematical expression for even ideal conditions approaching practice, but some general considerations that have occurred to me may be suggestive to others working on the problem, and I offer them in response to your invitation for discussion.

First—The tractive force that the locomotive, capable of developing a constant horse power, can exert is inversely as the speed, and may be expressed by the theoretical formula $T = \frac{375\,IHP}{S}$, where T is the tractive force in pounds and S is the speed in miles per hour. This formula holds for well proportioned engines at high speeds, and approximately for such engines at speeds above about 10 miles an hour. Below 10 miles an hour the tractive force is nearly constant, being limited by the weight on the drivers. The engine ought to be able to utilize the whole tractive force of adhesion at 10 miles an hour.

Second—Train resistance is less as the speed is less, but with a limit. The general form of the train resistance curve is probably not a straight line, though it may approximate to this at high speeds. The general form is probably not far from that given by Mr. Wellington at page 518 of his "Economic Theory of Railway Location." Empirical formulas that fairly represent Mr. Wellington's curves have been determined by Mr. Sanford Cluett, C. E., to be

$$\text{For loaded cars } R = 3.8 + 0.0076S^2 + \frac{16.4}{(S+1)^2}.$$

$$\text{For empty cars } R = 5.4 + 0.01S^2 + \frac{70}{(S+3)^2}.$$

Variations in the constants only are necessary to get very close to the truth. But the essential feature to be noticed is that the resistance, given by the formulas in pounds per ton, is a minimum at about six miles an hour. It is also to be noticed that the increase from the minimum at six miles is at first very slow as the speed is increased. At 10 miles, an increase of 67 per cent. in speed, the resistance is increased only about 7 per cent.

From these considerations it would seem that very little is to be gained in traction by decreasing the speed below 10 miles an hour. According to a paper presented by Mr. E. M. Herr to the Western Railway Club, the carded time on Mr. Kendrick's road is from about 13 miles to 17 or 18 miles an hour according to the division and direction of motion.

Assuming that some definite speed—as 10 miles an hour—gives the greatest hauling capacity of the locomotive, let us ask what this means.

Does it not mean the speed at which the ruling grade of the division or road is to be operated? And is it possible that higher speed elsewhere will affect the trainload? It may if the higher speed is too high for the high minor grades. But will a higher speed on down grades and light grades and levels decrease the trainload? Not until the speed is so high that the work to be done by the locomotive equals that done on the ruling grade at the low speed. If a given locomotive handles a given train at 10 miles an hour on a given ruling grade, the maximum possible speed with the same train for all minor grades not operated as momentum grades may easily be determined.

Let us assume an engine with 150,000 lbs. on the drivers, and capable of developing 1,000 horse power, and that the full power may be had at 10 miles an hour. The tractive force of this locomotive will be about 37,500 lbs. at 10 miles. This is better than most locomotives will do, but the figures will serve for the illustration. If the ruling grade be 1 per cent., the load that can be hauled at 10 miles is 1,512 tons gross. Using this load, Mr. Wellington's curve of resistances, and the formula for tractive force given in this letter, we can compute the following table of speeds that can be maintained on various minor grades:

Table showing speeds at which a 1,000 H. P. locomotive with 150,000 pounds on drivers, and with ¼ adhesion, can draw the train it can just handle at 10 miles per hour on a 1 per cent. grade.

Grade, per cent.	1.0	0.9	0.8	0.7	0.6	0.5	0.4	.03	0.2	0.1	0.0	−0.1	−0.2	−0.3	−0.4	−0.5
Speed miles per hour	10.0	10.8	11.9	12.9	14.2	15.8	17.3	19.3	21.0	23.2	26.2	28.7	31.5	34.2	37.0	39.9

Nothing in weight of train is to be gained by reducing the speed below these limits. Mr. Kendrick bases his statement on the increased tractive power of the locomotive at low speeds. It would therefore seem from this consideration alone, that there can be no most economical freight train speed applicable to all roads alike, but that for each road, and each division of each road, there is some average speed, depending on the arrangement of the gradients, that is most economical for that road or division. For it must surely go without saying that slow speed is not economical per se. With the weight of train fixed by other causes than speed, the highest possible speed will permit a given daily business to be handled daily by a minimum equipment and train force.

It may be true that 10 miles an hour is not the proper limit to adopt, for one of the lines on a diagram in Mr. Herr's paper, already mentioned, shows rapidly increasing tractive force down to two or three miles an hour, where one-third the weight on the drivers was utilized. But this must be regarded as an exceptional performance not to be included in average or general conclusions. This result was obtained by using a compound engine simpled at the low speed, on a sanded dry track, conditions not pertinent to general every-day running, though answering for emergencies.

If a division of a road extending east and west is made up of almost continuous ascent from east to west, varying from level to 1 per cent. and averaging about 0.5 per cent., the average speed westbound can not exceed about 15 miles an hour if the engine already considered is loaded for 10 miles on the 1 per cent. grade. The precise speed would depend on the arrangement of the grades. Eastbound, the average speed may be anything considered safe, not exceeding an average of something over 40 miles an hour. If 40 miles is considered the limit of safety then the average will be brought down to about 25 to 30 miles or thereabouts. If, on the other hand, the division is an undulating one with about as much rise as fall in going either way, the precise speed can not be definitely determined except by trial, but the profile averaging about level, it may be possible by the use of velocity gained on the down grades to average something like 26 miles with the train that can be hauled at 10 miles on the ruling 1 per cent. grade.

If, on the first division mentioned, the average grade be about 0.25 per cent. the average speed may be 20 miles or more, while a table for a 0.5 per cent. ruling grade similar to that given for a 1 per cent. ruling grade will show for an average 0.25 per cent. grade a possible average speed of only about 13 miles westbound. Since a different engine will also show somewhat different values than those given in the table, it must follow from this and what has preceded that if the most economical speed is that which secures the maximum hauling power of the locomotive, each division of each road must have its own most economical speed for each direction, depending on the locomotive used, the rates and arrangement of the gradients, and the relative volume of business in the two directions.

This consideration suggests this interesting fact, namely: The cost of rise and fall on minor grades varies not only with the amount of rise and fall, as is generally stated, but directly with the rate of the grade as well.

This discussion also brings out the further interesting fact, that the light ruling grade road, always considered superior to the heavy grade rival, is or may be at a disadvantage in the matter of speed. It will always have the advantage that at the same speed it can do a given business with fewer trains than its high grade competitor, but the competition will very probably prevent its adoption of the seemingly most economical speed.

We have yet to consider whether the speed that gives the greatest hauling power is necessarily the most economical, but the problem from this point on is quite complex, since it must bring in all of the practical difficulties of train operating and engine running, and the effect on wages and maintenance account. This portion of the problem we may hope to have solved by the men whose every day business it is to consider these questions.

W. G. RAYMOND.

Closing the Slot in M. C. B. Knuckles.

Jan. 12 we published a discussion by Mr. J. W. Luttrell before the Western Railway Club, on the subject of closing the slot and pin hole in M. C. B. knuckles. The views expressed by Mr. Luttrell met with the approval of those present and Mr. G. W. Rhodes, Assistant General Superintendent of the Burlington & Missouri River RR., in a letter to the Club, makes the further suggestion that a good deal can be accomplished at once by reducing the depth of the opening between the lugs. Of course, it is conceded that solid knuckles cannot be used largely until the old link-and-pin couplers are out of the way. The following extracts are from Mr. Rhodes' discussion:

It is rather singular, that with all the discussions and reports and good work that has been done by the Master Car Builders in the matter of designs and specifications for the M. C. B. coupler, the subject of the depth of opening between lugs has hardly been discussed at all, and this opening remains without any material change from when the knuckle was first designed, and, moreover, without any specific dimensions as to what the size should be. I have seen knuckles measuring at the opening, from 1⅞ in. up to 2¼ in. No one takes any exceptions to such a variation, although it is a vital point in connection with the strength of the knuckle. Twelve years ago when the M. C. B. coupler for freight service was first being investigated, and when different classes of breakages were recorded and kept more accurately than to-day, knuckle lug breakages were the feature of all records and reports. This condition was doubtless aggravated at that time, owing to the greater variation in the height of drawbars that then existed, and the fact that single lugs had frequently to take the entire strain, whether it was buffing or pulling. This condition has been much improved since Congress adopted a law fixing the maximum height of drawbars at 34½ in. from the center of the bar to the top of the rail, and the minimum at 31½ in. Even with these figures in the very excellent report presented to the Master Car Builders' Association in June of last year, the committee clearly shows that with maximum and minimum height of drawbars coupled together, single lugs only will be coupled. The committee not only shows that with cars conforming in height to the maximum and minimum allowed by law, there is danger on rough track of one car disengaging from the other by the knuckles passing over each other, but it also shows, beyond room for question, that single knuckle engagements do occur in service, and I do not believe that any one of us would say that any single lug now made, is strong enough and safe enough to stand all the pulling and buffing of trains that freight cars are subjected to in service.

I believe these couplers in a general way have more than met the expectations and the requirements of the railroad men. Yet at a recent hearing before the Interstate Commerce Commission it was reported by one of the inspectors of the commission that 25 per cent. of the M. C. B. couplers were out of order. I believe we will all agree that even if half this condition of bad order prevails, every effort must be made to produce a better showing. I believe it will not be disputed that knuckle breakages are still one of the greatest causes of failure with the M. C. B. coupler. The Master Car Builders' committee of 1899, has shown beyond dispute that living up to the law's requirements we will have every now and then single lug engagements. Can there be any stronger argument for making a move to strengthen the single lugs, and is there anything that will strengthen them so much as adding a quarter of an inch more metal to each lug? We do not refer so much to the strongest and best knuckles now made. Perhaps their breakages in lugs may not be excessive. It will not be disputed, however, that there are scores of knuckles that will be materially strengthened with a little more material in the lugs. Why not allow this?

A year ago the Chicago, Burlington & Quincy ordered

50 steel knuckles cast with 1½-in. lug openings. These knuckles were distributed to the master mechanics of seven of the divisions with instructions to apply the knuckles to the way cars. The rules require all air brake cars to be fitted with M. C. B. couplers, and as all air brake cars are required to be placed in the front part of the train, it results in the link and pin bars getting next to the way car. It was, therefore, considered that these knuckles would be placed in the most objectionable part of the train, if there was any objection to their use. They have now been in service over a year, and I believe I am safe in saying that the first complaint has yet to be made to any officer of the road. The reason that no complaint is offered, we believe, is very evident. The heaviest single D-shaped link measures but 1¼ in. deep, the opening in the knuckle being 1½ in. There can be no question as to the ability to make a link coupling in such a case should it be required. Especially is this the case with the uniformity that now prevails and is required by law in the height of cars. I believe some links are made as large as 1⅝ in. in diameter. It may be that such a link could not be inserted at the upset or welded in through a 1½-in. opening, but in such cases there is no reason why the middle of the link cannot be inserted between the lugs.

Personally, I believe the lug opening should be reduced to 1½ in. I am satisfied that this can be done without any inconvenience and that it will add vastly to the strength of the knuckle. This opinion is based on a year's experience with 50 of such knuckles. I do not believe in our very quickly being able to adopt a solid knuckle. In case the opening recommended should not meet with the general prevailing idea, surely some of the railroads can adopt a knuckle opening of 1¾ in., and refuse to accept from the manufacturers any more knuckles the openings of which exceed 2 in.

The South Terminal Station at Boston.

In the December issue of the Proceedings of the American Society of Civil Engineers appears an admirable paper on the South Terminal Station at Boston, written by Mr. George B. Francis, Resident Engineer in charge of the work. The paper fills 63 pages of the Proceedings and is illustrated with many engravings from photographs and from drawings, and (what is unusual with such a paper) is supplemented with an index to special topics. Altogether, it is a remarkably thorough description.

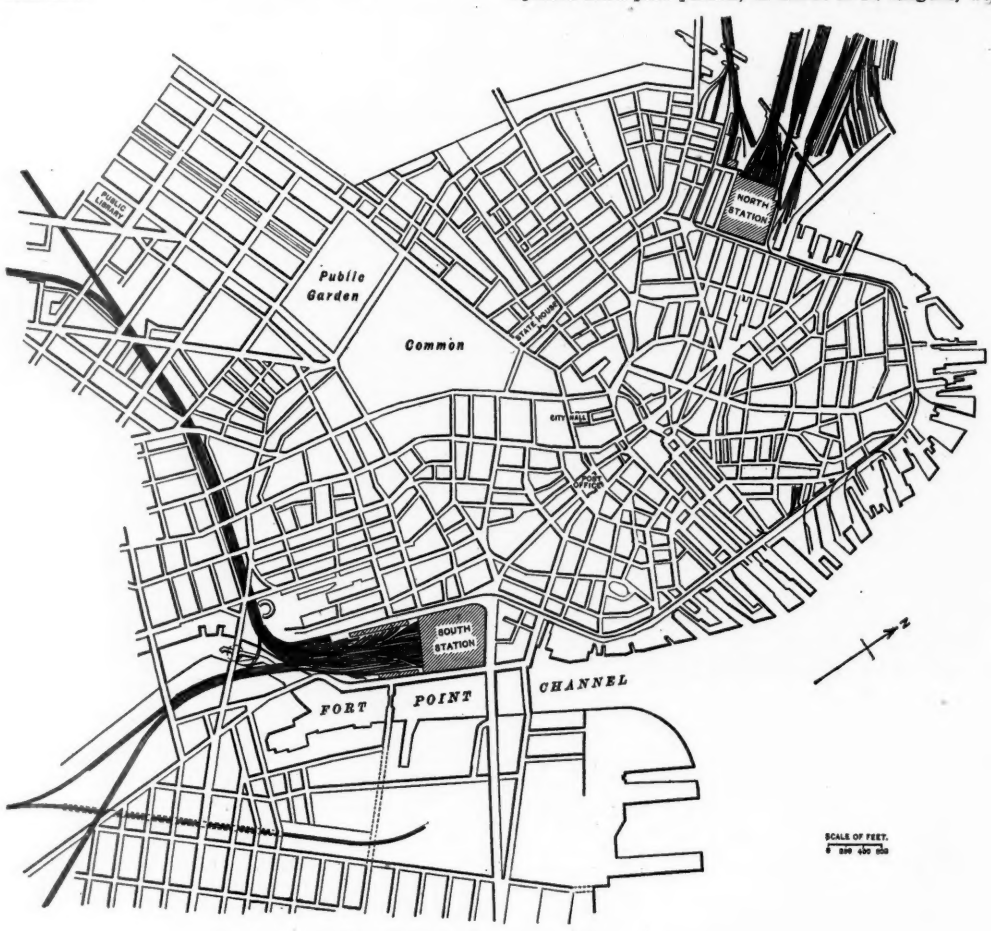
We have already published a number of articles about this station, more recently about the signaling, but the extracts from Mr. Francis' paper which follow give considerable information which has not heretofore got into print, while repeating no doubt something of that which we have printed before. The more important articles which we have published are, pp. 2 and 27, 1897, plans and general description; p. 490, the engineering equipment of the building; p. 320, 1898, water-proofing and drainage; p. 3, 1899, general description; p. 19, some special arrangements for comfort; pp. 331, 518, 776 and 882, signaling and interlocking and general views, and p. 50, 1900, interlocking. What follows is from Mr. Francis' paper.

Many plans were made for the general layout of the entire station, finally resulting in the double-floor arrangement which has been constructed, the upper floor to be used for regular steam railroad trains, and the lower floor for suburban trains, using a special motive power, and running upon the same main roadbed. As the railroad traffic about Boston has some characteristics different from almost any other American city, a short account of the line of reasoning which led up to this form of station will not be out of place. Upon the railroad routes within 50 miles of Boston, about 50,000,000 passengers are carried to and from the city each year, nearly equally divided between the North and South Stations. The close approximate population within the 50-mile, or say, suburban, limit is 2,392,000. Within the same limit around Philadelphia it is 2,289,000; aroung Chicago, 1,188,000; around St. Louis, 874,000; and around New York, 4,754,000; New York, only, exceeding Boston. These figures show the reason for large terminal facilities in Boston, and the existence of the South Terminal Station.

It was decided at an early date that the new station must be so built that the new motive powers, electricity and compressed air, one or both, could be used therein; that a large increase in suburban trains, due to smaller train units and more frequent service, could be had, and that every effort possible should be made to remove the handling of baggage from the passenger platforms. The first plans contemplated only a single floor for train service, but after arranging as well as possible for the various controlling features, making numerous studies for the exclusion of baggage trucks from the passenger platforms, and developing several ways of expeditiously handling electric cars, considering both high platforms on a level with the floor of such cars, and low platforms as an alternative, it was found that such unusual features tended to use up space, and that instead of 30 or more tracks, which it was hoped could be had, the number was reduced to 28. This was discouraging, as the old stations contained an aggregate of 25 tracks, and the increase of only three did not promise that opportunity for future growth which it was reasonable to expect.

There being no reasonable hope that a greater width of land could be secured, attention was directed to the possibility of divorcing the suburban, or short-distance, service, from the long-distance service, and placing the former at a different level, thus doubling the room for tracks on certain areas. The first sketch of this sort diverted the proposed suburban tracks about half a mile from the station, and by a gradually rising grade brought several tracks on either side of the train shed to a level about 24 ft. above the main floor. These were to be stub tracks, like those on the main floor. This arrangement did not do away with the necessary switch system for making up trains outside of the station for each floor level; and upon its development, it was seen that if the elevated stub tracks could be connected in the form of loops, the train movements would be very much lessened, and the number of switches at the entrance largely reduced.

The extreme width of the station made the loop connection possible, and a plan was drawn accordingly. This was the first loop-track study. There was some doubt, however, as to the advisability of having upper platforms about 28 ft. above the main floor (which would be the case if high platforms were used) on account of the appearance of the structure, the difficulty of handling baggage, the nuisance from the smoke and steam of the locomotives below, as well as the advisability of avoiding stairs. The approaching grades were also steeper than was desirable.



The Terminal Stations at Boston.

The possibility of a suburban loop-track service upon a floor beneath the main floor was considered next. As the main floor of the station was designed at that time to be only about 6 ft. above the highest tides, it required to be raised to the highest level possible without the use of stairs at the entrances from the streets, which was prohibited. The main floor was raised 4 ft., and inclines were introduced at the entrances. Even this placed the lower tracks, which were finally designed to be 17 ft. below the main-floor tracks, 7 ft. below very high tides. This immediately introduced the study of waterproofing this great area to shut out the water. Due consideration showed it feasible to do this without prohibitory cost. Placing the loop-tracks 17 ft. below the main floor and using high platforms for this kind of service made easier approach grades, stairways of 13 ft. rise instead of 28 ft., as was the case with elevated suburban tracks, simplified the handling of baggage, improved the appearance of the main floor, and did away with the smoke nuisance.

The one great feature which made the loop system attractive was the making of this great terminal a through station for one kind of service and a terminal station for the other. Suburban trains do not carry mails, express matter, or baggage in any quantity. They carry people only, and should be run frequently and got out of the way rapidly. The through station idea made it possible to handle as many trains at the terminal as it is possible to run over a main line, the trains leaving their passengers and moving on without swtching. If the coming motive power should be electricity, through a third rail, it will not conflict with the immense switching system which must be maintained at so large a terminal.

As this station must eventually provide for suburban trains from the four main lines, such trains must leave the station at shorter intervals than trains could be run on either main line alone. This was provided for by arranging, with a minimum amount of switches, two loop tracks to be used alternately, each capable of holding several trains, one track to be filled while the other is being cleared. By this means trains can remain in the suburban station much longer than the actual time interval between trains. These loops could have been arranged to operate with even a less number of switches than designed, but it would have obliged all trains from some routes to use one loop exclusively, whereas it was desirable to make the forward loop available for all routes to its full capacity.

Coffer Dam.—The coffer dam which it was necessary to construct, and without which it would have have been impossible to execute the work, merits a brief description. As the borings show an underlying stratum of clay within the reach of a single length of timber, it was evident that a continuous timber wall driven into this clay close enough to prevent leakage in the joints would positively exclude the water. With this sort of a wall surrouding the work no trouble would result in execution. In some places this line of timber wall, consisting of 6-in. splined hard pine planks, in about 40-ft. lengths, was doubled to give sufficient lateral strength to resist pressure from open water; at other places it was a single line.

Wherever this sheet piling was driven it was necessary, first, to remove entirely any stone or timber in the way. Any failure to do this was disastrous. There were some exasperating delays in the removal of the obstructions, obliging the use of several divers and a wrecking outfit, but eventially the entire terminal excavation was shut off from the salt water on three sides, and in some pockets on four sides, with this timber wall.

From the very start up to the present date there has been no flooding of the lower floor, the coffer dam having effectually done its work. The cost of this dam has been about $75,000. It is also of use in connection with the permanent shutting out of high tides, thus reducing excessive pressure on the waterproofing. By some it has been considered that the coffer dam presented the most difficult feature of the undertaking, and that without success in this particular, it would have been impossible to execute the work. The total length of this dam was about 3,000 ft.

Waterproofing.—The permanent waterproofing sheet, which underlies the whole lower floor, consists of ten layers of tarred paper, swabbed together with hot coal-tar pitch. The layers are carefully lapped, and all built in place. This continuous sheet of waterproofing, amounting to 56,000 sq. yds., or upwards of 10 acres, is laid, where horizontal, upon a concrete base, troweled to a smooth surface. In some of the softer places boards were laid down under the concrete base, but usually this base, 6 in. thick,

rests upon the ground. Where the waterproofing is on the vertical walls, it is backed up with 8 in. of brick work. In all cases the horizontal sheet lies between the pile heads and the granite masonry above.

Upon the waterproofing sheet, where it is not weighted down with walls, there is placed a loading of a cheap grade of Portland cement concrete, sufficient to resist the upward pressure of the water, which is, on the horizontal layers, about 500 lbs. per square foot, this pressure being dependent, of course, on the elevation of the sheet, with reference to the ground-water level. In some places the weight of the walls is far in excess of the water pressure; in others, where possible, the pressure is resisted by inverted concrete arches. Up to the present time no leakage in this great area has been discovered.

Cement.—The Portland cement used throughout the work was the Alpha brand of American Portland cement. The masonry and concrete in the work required a large quantity of cement, but did not demand that an extra fine quality be used, as might be the case with work done under running water. Specifications were purposely drawn to admit the use of any good average brand, foreign or American, either slow or quick setting, with the object of opening the bidding to lively competition and a low rate. The specifications required, for Portland cement, a tensile strength of 200 lbs. per square inch in 24 hours, having stood in air until set, and the remaining time in water; and for natural cement, a tensile strength of 100 lbs. per square inch when tested in the same manner.

This method secured the cement at very low rates. About 75,000 bbls. of Portland cement and 20,000 bbls. of natural cement have been used, and, in the case of the Portland, it is believed that nearly $1 per barrel was saved over what would have been the price if a rigid specification had been adopted and a limited number of brands allowed.

A great many tests for tensile strength were made, and in no case was it necessary to reject cement. Owing to the large consumption of the mill product, only a small amount of cement could be kept on hand, and it was impracticable to make more elaborate tests before the cement was used in the work. The proof that the cement is of a most excellent quality lies in the actual character of the concrete after it was put in place, even the poorest quality of concrete, consisting of ten parts of sand and screened gravel to one part of cement, requiring the use of hand stone-cutting tools where it has been necessary to open it for pipe ducts or other purposes.

Owing to the reduction in the cost of manufacture, and the ability to use Portland cement mortar in zero weather without injury, and also the possibility of obtaining excellent mortar with a very small proportion of cement, making the total cost of work done on a par with natural cements, the tendency to use Portland cement exclusively will undoubtedly increase very rapidly.

Train Shed Roof.—The train shed and midway are lighted through asbestos covered wire-glass, bedded in putty, fastened in with wooden strips in wooden sash, fastened with brass screws to wooden frames bolted to the train-shed steel. All the glass is set vertically, and permanent foot walks have been provided, so that it will be possible to reach each pane of glass in the shed at any time with brushes and water to keep it reasonably clean. The glass is ⅜-in. thick.

It is not intended that it shall be necessary to shovel any snow from the main roof. All the down spouts, which are 8 in. in diameter and generally 60 ft. apart, are covered with jackets, and steam pipes have been run between the spouts and the jackets to keep them from freezing in the coldest weather.

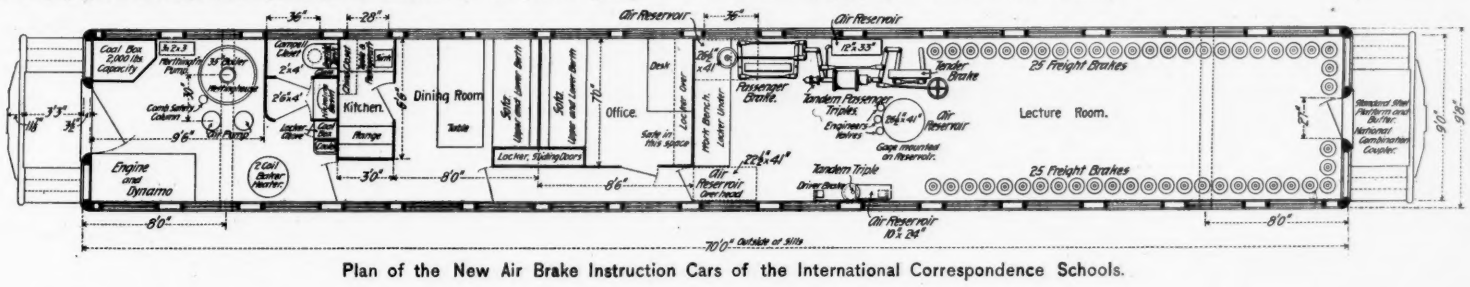
It is believed that this is the first instance where foot walks have been provided on such an extensive scale, practically to every window, in any train shed, and where the lighting is done exclusively through vertical windows. The result has been very satisfactory.

New Air Brake Instruction Cars.

As is well known, the International Correspondence Schools of Scranton, Pa., now has three "enrollment" cars, being long coaches each fitted with living apartments and a lecture room, and these are continually traveling from point to point. In this way the school supplements by lectures and personal instruction the lessons furnished by correspondence. These cars have been found so useful that three air-brake construction cars are now to be built on the plan shown by the engraving.

The apparatus and the arrangement is apparent from the plan, and these cars will be very complete. It is unnecessary to enumerate all the apparatus, but attention may be called to the large lecture or class room fitted with 50 Westinghouse freight car brakes and piping and air signal apparatus. The brake cylinders are all placed along the sides of the room, so that the action of each can be studied, the engineer's valves and the gages being mounted on an air reservoir in the middle and at the head of the lines of cylinders. Full size working models of passenger, freight and tender brake riggings will be provided, as well as sectional triple valves connected tandem to the stems of operating triples. Three large air reservoirs will be used.

The specifications provide that the three cars shall be alike in all respects, each being 70 ft. long over end sills and 9 ft. 8 in. wide over side sills; the heighth from the top of the sills to the under side of the plates is 6 ft. 7½ in. The center and side sills are 5 x 8 in. and intermediate sills 4 x 8 in., all of yellow pine; the side sills being plated with a



Plan of the New Air Brake Instruction Cars of the International Correspondence Schools.

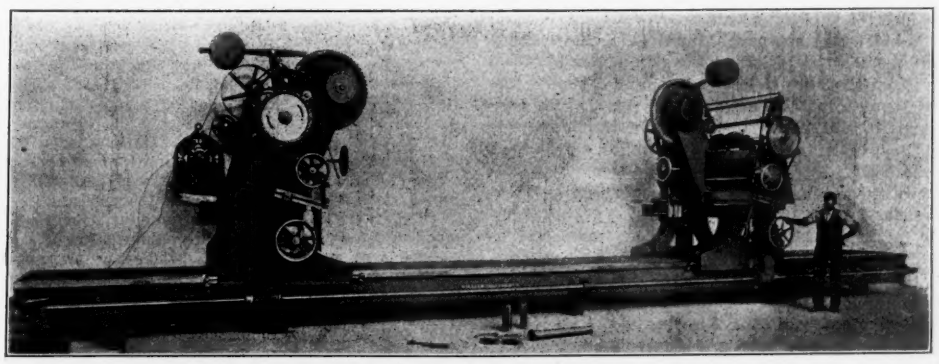
½ x 7 in. steel plate extending back 18 ft. from the ends. A plate ½ x 3 in. is placed along the sides under the window sills, on the inside, and is framed into the posts and braces. The floor consists of four layers of $\frac{3}{16}$ in. Southern pine; the top course is laid longitudinally, the next course diagonally and one floor is placed between the sills with a ¾-in. layer of hair felt on top. Six-wheel trucks with a wheel base of 6 ft. 10 in. will be used.

The following special equipment is called for by the specifications: Chicago Railway Equipment Co., roller side bearings; Standard steel platform and buffers; National combination couplers; Westinghouse high speed brakes; McKee brake slake adjusters; Monarch solid brake beams; Diamond "S" brake shoes; McKee-Fuller wheels with Latrobe steel tires; Scott springs; Forsyth curtain fixtures. There will also be a Baker heater, Worthington pump, Westinghouse vertical boiler, Ohio injector, a full equipment of Westinghouse brake apparatus for instruction purposes, and a small engine and generator which will furnish current for lighting the car and for working the electric stereopticon; in addition, the Pintsch gas lighting system will be installed.

Locomotive Frame Slotting Machine.

The locomotive frame slotter shown in the accompanying illustration, while not an entirely radical departure from existing types, has new and original features. One is the unusual massiveness of the slotting head, and another is the independent driving arrangement.

Each head has its own motor. The two slotting



The Sellers Locomotive Frame Slotting Machine.

heads, or three if necessary, are entirely independent of each other in all their movements. In the ordinary machine worked by a shifting belt, it is sometimes desirable for the operator to throw off the belt so that the momentum of the machine will carry the slide, for example, to the top of the stroke before it stops; while in this machine the movements, being transmitted through friction clutches, can be stopped or started quickly and without stopping the motor.

The size and weight of the moving parts of such a machine as this make hand movements heavy and slow. In this machine all the movable parts are driven independently, so that the head may be run

The feed is adjustable in both directions. The cross rail is swiveled to suit tapers up to 1¼ in. and the travel of the head on the bed is made for frames 32 ft. long. The bed itself is 42 ft. long, but can be made to suit any length of work desired. Each head has a width between the uprights of 48 in. The total travel of the saddle on the cross rail is 54 in. and the clear height under the cross rail 23¾ in. Brass taper shoes guide the saddle on one side. The rapid travel is controlled by friction clutches. The feed along the bed is variable from .014 in. to .17 in. and transversely from .006 in. to .102 in.

Three of these machines, which are made by the William Sellers & Co., Incorporated, Philadelphia, have been ordered for the Baldwin Locomotive Works.

Packing Journal Boxes.

At a recent meeting of the Central Railway Club Mr. H. C. McCarty showed and described a model journal box devised by him to teach men how to pack a box. It is partly of glass that the condition of the packing may be seen. We print some extracts from his remarks:

The principle of the box is such as to enable the men to make a practical demonstration of the exact effect of their method of stirring up the packing in a box, and if their methods are in any respect deficient, they may also observe the effects of a proper treatment of the packing, especially on the sides and rear of box, which portions are quite commonly neglected, the interest of the average man may be awakened and the effects of his work greatly improved. Efforts in this, or some direction of this kind, are a necessity if we may hope to improve and secure more satisfactory service, as I fear that on many roads the details of his work have not been given sufficient serious and personal attention.

The height of packing that has been found to produce the most satisfactory results gives the top line of packing to correspond about with the center line of the journal, thus leaving the packing entirely clear of the lower edges of the brass, and the packing in the front end of the box should be slightly below the opening in the box, to prevent waste of oil out the front of the box.

The packing in rear of box, when not properly maintained, loses contact with journal at rear end;

this is caused, in some cases, by not packing the back end of box firmly enough, and also more especially owing to improper treatment of the packing on the sides and rear portion of box at terminals prior to oiling, in combination also in some cases with a lack of packing tools well adapted for accomplishing effective results in the least possible time. A more important, feature, however, is that it clearly shows to the man the exact effect of his method of stirring up the packing prior to oiling, if the practice he has followed does not restore the packing on the sides and rear of box to proper relation with journal, this will be clearly and positively demonstrated to him, as well also as the effect of such slight change that may be necessary in his methods to produce desirable results, and effect the most elastic condition of the packing so that the oil in the box may be freely conveyed to the journal. The necessity for treating the packing in this or a similar manner will be quite apparent to anyone who will make the most casual observations of the solid non-elastic condition the packing assumes through a failure to give it proper attention at the back end of box, and when in this condition, it not only fails to convey oil to the journal, but actually becomes in time hardened and glazed, the effect of which is to wipe or scrape off any oil that may reach the journal from the forward part of the box. The lubrication, therefore, is so retarded that in a short time will result in the heating of the journal. At the same time that this condition exists in the back of the box, the appearance of the packing near the front of the box may be very good and a man that gave attention to the packing just prior to journal heating would be under the impression that the treament he gave it was all that possibly could be done.

Another drawing shows a journal box having an excessive quantity of packing, which is not only a wasteful practice resulting in a loss of oil out of the ends of the box, but is also detrimental to good results, as by this method of so completely filling up the box with packing a condition is caused that frequently results in threads or small particles of packing becoming caught between brass and journal. This occurs by violent shocks produced in switching and application of brakes, when relation between brass and journal is sufficiently disturbed to permit small particles of waste being caught under the edge of brass and journal. This is particularly true when the packing is pressed up close around the brass. This is not an infrequent cause of very serious cases of hot driving boxes on engines. The effect is that the oil is wiped off the journal and the surface thus becomes dry. It is therefore apparent that in stirring up packing the top portion should be entirely below edge of brass. In stirring up packing, it should be understood clearly that all that is required is a slight loosening up of the top surface of the packing on each side of journal, keeping back of box well closed up by maintaining packing at proper height. The top layer of packing will thus be kept in a light, elastic condition next to the journal, which is most desirable in order that the oil may be freely conveyed to the journal from the more solid portions of packing underneath. A general disturbance of the packing should be avoided as no good results can be secured by this method.

Suitable tools for this work are essential. I attach herewith a sketch illustrating a packing tool made of steel that has been found well adapted for the work of slightly stirring up packing in journal boxes. This will apply to both passenger and freight cars. Its efficiency depends in a great measure in following out the practice of stirring up packing as described. The practice of placing it down under the entire bulk of packing at sides of box I think quite questionable, for the reason that when this is done the entire bulk of packing on the side of box is raised bodily from the bottom of the box, and I should like to have you consider carefully if this is the case how long it will likely remain up in that condition after the car is in motion. It will all settle back in a short time in a non-elastic condition. This tool combines the features of the commonly known packing iron and hook.

I desire to refer to the quantity of waste and oil in a journal box when packed in the usual manner. Each box contains from 1¼ to 2¼ lbs. of waste and from 4½ to 10 pints of oil, depending upon the size of box, varying from 3¾ x 7 in. up to the 5½ x 10 in. box. It will thus be seen and appreciated, I believe, that to properly utilize the oil that is in the box, the packing next to the journal should be maintained in as elastic condition as possible. It should be further understood that the oil as it passes between the surfaces of the brass and journal is not actually consumed, but is deposited again on the opposite side of the journal from which it ascended for use again an indefinite number of times.

In numerous tests made by various railroads a very unusual high mileage has been made from the one re-packing of the box or boxes, without the addition of any oil during the test. In some of these tests the mileage has been from six to twenty thousand miles. During the test the packing was examined daily and maintained in an elastic condition as previously described, no oil, however, having been added during the test.

I desire, in conclusion, to emphasize the fact that the most important part of the work of lubrication is the skillful and proper maintenance of the packing in the box, so that the most elastic condition may be secured and maintained.

Northwestern Electrical Association.

The eighth annual meeting of this Association was held Jan. 17-19 at Milwaukee, Wis. About 170 members and guests were present, the relatively small attendance being due to the fact that many central station men were too busy to attend. The opening session was called to order about noon on Wednesday, Jan. 17, by Mr. H. L. Doherty, of the Madison Gas & Electric Co., Madison, Wis., President of the Association, who read an address which was, in part, as follows:

The year just closed was one of remarkable activity and prosperity and the benefits cannot be dissipated for some time to come, even under adverse conditions. The most substantial progress has been toward the improvement, from experience, of former developments, and better mechanical work. The steam turbine has been Americanized and bids fair to supersede, in a great measure, our present engines. Experimental work indicates a marked economy of steam consumption, with other advantages. American built, high-speed engines capable of being direct coupled to arc dynamos are in successful operation, and in steam economy equal most modern multi-expansion engines. The older types of engines have nearly all been greatly improved in detail and there is a constant tendency for smoother running and better regulation. The exploitation of the electrical business has done much toward the development of steam practice. While there has been no marked improvement—except, possibly, for the steam turbine and the higher speed engines—the general operating results have been materially bettered.

Gas engines are now being built with satisfactory regulation and of any desired size.

Aluminum wire is in satisfactory use as a substitute for copper conductors, and it would seem advisable to use aluminum as much as possible to assist in bringing the price of copper to a more reasonable figure. The use of exhaust steam for heating near-by buildings is being adopted by numerous plants.

The distance and high-voltage limit of transmission is being increased, and a recent plant will transmit current for 155 miles at 60,000 volts. Two installations will be made this year of 25,000-volt cables underground.

The manufacture of producer gas is capable of further development and economy, and even under present conditions producer gas and gas engines will yield a unit of energy for the least consumption of fuel. This field deserves the serious attention of engineers. It has a special value to central stations and other power plants with an irregular load. . . . A producer-gas furnace (barring radiation) has about the same efficiency at all loads, and gas can be stored, while the storage of steam is almost impossible, and the storage of electrical current is not always practical or economical.

There has been little improvement in the direct-current methods in the last few years, but the most marked improvement has been made in the alternating-current appliances and methods. "Unaccounted for current" in alternating-current stations has often amounted to 80 per cent. of the output, and 60 per cent. is more nearly the average than the extreme. Modern transformers, up-to-date methods and equitable rates should reduce the "unaccounted for current" to an almost negligible amount.

The average central station is handicapped for the following reasons: First, improper and insufficient education of operators. Second, poor accounting. Third, lack of capital, and fourth, inequitable rates.

The ultimatum of perfection in central-station operation requires education in all branches of engineering, accounting and business methods. Good judgment and diplomacy are such necessary attributes that their mention here would be superfluous.

Select your employes with the usual requisites as to knowledge, truthfulness and judgment; but, by all means, when these talents are equal, choose the most highly educated talent the position will command. I would also recommend further education of present employes. Many correspondence schools are springing up all over the country, and I know some of them are good. . . .

If the accounting for central stations was intelligently and carefully done, and each item of their total expenses could be determined and compared with previous periods or results in other plants, I am inclined to think that the benefit would amount to more in the profit and loss account than the knowledge of how to construct dynamos with an efficiency of 100 per cent. Perfect superintendence is only to be had when supplemented by intelligent accounting and record keeping, and the use of registering and recording instruments. Good scales, engine indicators, recording station wattmeters and consumers' house meters will enable daily determination of "boiler efficiency" and "combined engine and dynamo efficiency" and monthly determinations of "line, transformer and meter efficiency." In many instances I would go even further than this, and recommend primary meters on every bank of transformers, and thus check the accuracy of consumers' meters by districts, and enjoy a better opportunity to protect the station from thefts of current.

Each separate item of cost should be accounted for separately, and items like fuel, labor, repairs, etc., should be determined per kilowatt for monthly or other convenient periods, and compared with other similar periods, aiming, of course, to continually reduce such cost. Cost of reading meters and trimming arc lamps should be computed both on cost per kilowatt sold and also on the basis of cost per meter and arc lamp installed.

So-called good bookkeepers and accountants are often nothing more than good copyists. A really good accountant must be able to determine and keep advantageous subdivisions of income and expenses that will enable comparisons to be made, which will permit the former to be interested and the latter decreased. . . .

The necessity of some equitable method of charges is of greater importance than the attention given this matter would lead one to believe. . . . All plans so far proposed are manifestly inequitable under some conditions.

A few years ago capitalists had little or no confidence in the earning capacity of central stations. To-day they are pretty well convinced of their earning ability; but they are afraid that all the electric plants are going to be absorbed by the municipalities, and capitalists generally are not sufficiently familiar with this business to be able to judge of its merits from an investment standpoint. A united and determined fight to educate the public on the fallacy of municipal ownership is desirable, and good accounting will do much to heighten the credit of the central station business. Good and uniform accounting would do much toward accomplishing this end.

The agitation about "municipal ownership" seems to be as active as ever, and, to be frank, I think it is increasing rather than diminishing. Without commenting on the motives of many of the leaders, it must be admitted that others of them are sincere and honest in their advocacy of this cause. If this craze is allowed to run its course, popular opinion will, in time, desert it; but, in the meantime, many of our properties will be injured, and the cities adopting it will reap a harvest of disappointment for their failure to give the matter proper consideration.

The development of water powers represents a field of great activity, and one highly profitable if backed by caution, good engineering and judgment.

The power thus secured is not always quickly stable, and unexpected extra costs have often run the fixed charges to a figure that, when added to the operating expenses, exceeded the cost of steam power. This has been the case particularly when the cost has been reduced on the basis of quantity sold. Many central stations have a maximum-load peak 15 to 20 times the minimum load, and if the cost of development per unit of power is high, the anticipated profits are never realized.

At the Wednesday afternoon session the report of Mr. Thomas R. Mercein, Secretary and Treasurer, was read and approved. The report of the Protective Committee on taxation of electric plants was read and placed on file and the subject of taxation was discussed at length. It was decided that the President appoint a Committee on Taxation to consider the subject and report at the next Convention, and a committee of five members was appointed, after which 17 new members were admitted to the Association.

The following papers were read and discussed:

"Modern Development in Alternating-Current Series Arc Lamps," by Mr. R. Fleming, General Electric Company, Lynn, Mass.

"Fundamental Ideas of Alternating Currents," by Professor Dugald C. Jackson, University of Wisconsin, Madison, Wis.

"Central Station Heating in Connection with Electric Lighting Plants," by W. H. Schott, Chicago.

"Central Station Economies," by H. W. Frund, Vincennes Electric Light and Power Company, Vincennes, Ind.

"The Polyphase Induction Motor," by Ralph D. Mershon, Westinghouse Electric and Manufacturing Company, New York.

"Relative Efficiency and Desirability of Various Types of Engines in Central Station Loads," by Professor A. W. Richter, University of Wisconsin, Madison, Wis.

"A Life Test of Incandescent Lamps," by Professor George D. Shepardson, University of Minnesota, Minneapolis, Minn.

The question of a summer meeting for the Association, postponed from a previous meeting and brought up in the report of the Secretary, was referred to a committee which reported on Thursday afternoon. A summer convention was recommended to be held after Aug. 20, the place of meeting to be settled by the Association, and after discussion the report was unanimously adopted. It was decided by a vote of 42 to 12 to hold the summer meeting at Waupaca, Wis., the exact date being left to a committee of which Mr. I. P. Lord, of Waupaca, is Chairman.

On the recommendation of a nominating committee, the following officers were elected for the ensuing year:

President—Pliny Norcross, Janesville, Wis.

First Vice-President—H. W. Frund, Vincennes, Ind.

Second Vice-President—H. J. Gille, St. Paul, Minn.

Secretary and Treasurer—Thomas R. Mercein, Milwaukee.

Directors—W. H. Schott, Chicago; George D. Westover, Cadillac, Mich.; Mr. Innes, Eagle Grove, Ia.

Mr. Norcross is President and principal owner of the Janesville Electric Co. and was born in Massachusetts 61 years ago.

On motion of Prof. D. C. Jackson, a committee of three will be appointed to report next year on the possibility and advantages of central station companies taking an interest in the entering of their employes on courses in correspondence schools.

Pintsch Gas on the New York Central.

The New York Central & Hudson River Railroad has recently made a contract for a Pintsch gas works at Albany and for the equipment of 434 cars for Pintsch lighting. This will complete the equipment of all the passenger stock of the New York

Central system and will give ample means for the supply of gas to all cars. When this contract is carried out there will not be a passenger car in service on the New York Central system, main stem or branches, that will not be lit by gas, however short the run.

The company now has three Pintsch gas works in operation, one of large capacity at Mott Haven, which supplies the New York terminal and a smaller one at Weehawken and another at Syracuse. The company also takes gas from the Pintsch works at Buffalo. A storage station is used at Utica supplied with gas from the Syracuse works by means of a gas transport car. This station is used to supply all cars which end their runs at Utica. Another supply station has been established at Watertown, which also receives gas from the Syracuse works, and the new contract calls for the establishment of still another supply station at Lyons, N. Y., as well as for the new works at Albany. This railroad has already running over 1,000 cars equipped with the Pintsch system and the new contract will bring the total passenger stock so equipped up to more than 1,500.

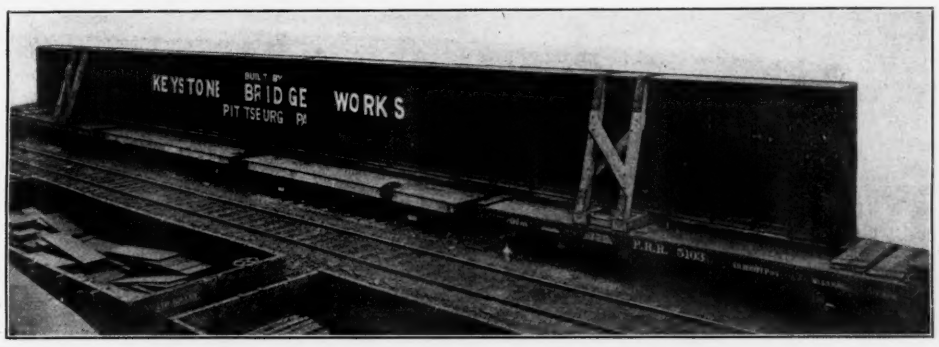
The use of gas lighting on branches and short runs is made practicable by the gas transport car, which enables cars to be supplied, when they cannot reach gasing stations, at a very small additional expense.

We are informed that arrangements have been made to equip all the coaches of the New York, Susquehanna & Western for Pintsch lighting, which would naturally be the case inasmuch as that road is now controlled by the Erie, and this method of lighting has long been standard on the Erie. Indeed, the Erie was, we believe, the first railroad in America to introduce Pintsch gas. The total cars now equipped in the United States for Pintsch gas lighting are 14,311.

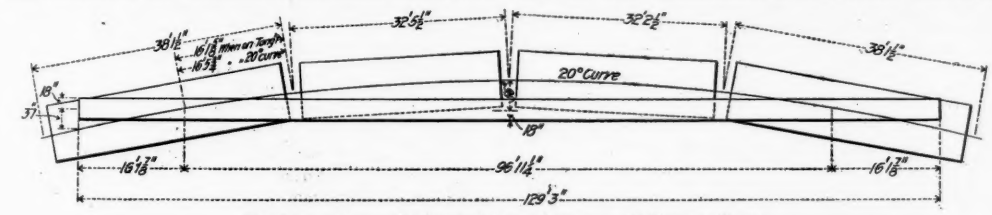
The Transportation of Long Girders.

The Keystone Bridge Works have recently completed some very long and heavy plate girders for the viaduct in the extension of Riverside Drive, New York City. These girders are for the long span crossing Manhattan Street. They were shipped over the Allegheny Valley, West Penn and Pennsylvania Railroad lines to Jersey City and thence lightered to Sixty-eighth Street, New York, for delivery over the New York Central to Manhattan station. These long girders consist of two box girders each 129 ft. 3 in. long, 3 ft, wide over all and 10 ft. 2¼ in. deep out to out of cover plates, and each weighing 124,000 lbs.; also four single web plate girders, each 125 ft. 10⅜ in. long, each pair of these weighing 155,000 lbs. The box girders were shipped singly and the single plate girders in pairs, each shipment being carried on four flat cars.

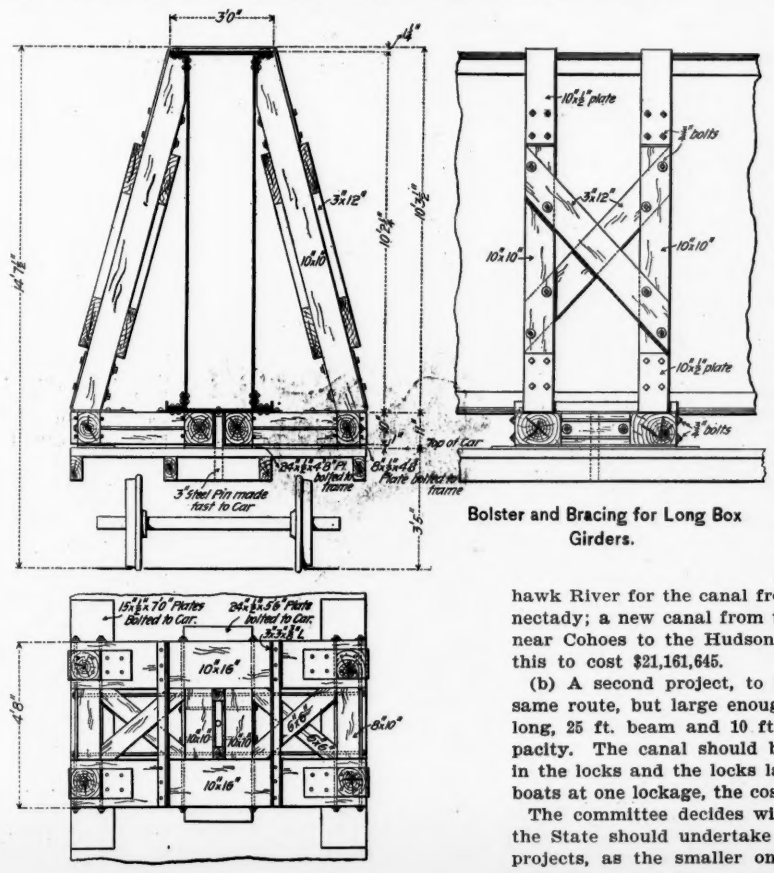
The method of loading and bracing is shown in the engravings. The bolster, shown in detail, is the one intended to take up the slip due to curves and provides for a total movement of 11 in. The other bolster, similar in design, has no longitudinal movement, being fixed by a 4-in. steel pin and free to move in a horizontal plane around the steel pin as an axis. The design and construction are sufficiently well shown in the engravings, the diagram of the relative position of girder and cars on the 20 degree curve being particularly interesting.



A Box Girder 129 ft. 3 in. Long, Rigged for Transportation.



Position of Long Girder and Four Cars on a 20 Degree Curve.



Bolster and Bracing for Long Box Girders.

The Canals of the State of New York.

Last March Governor Roosevelt appointed a special committee to report to him as to the proper policy of the State of New York in its canal matters. This committee consisted of Gen. Francis V. Greene, Major T. W. Symons, Corps of Engineers, U. S. A., the State Engineer Mr. Bond, the Superintendent of Public Works Mr. Partridge, and Messrs. Green, Schatcherd & Witherbee. The report of that committee was made public last week. The conclusions of the committee are summarized at the beginning of the report, and these we condense still further as follows:

(1) The canals should not be abandoned.

(2) A ship canal should be considered by the Federal Government, but not by the State of New York.

(3) The project of 1895 for the enlargement of the Oswego and Champlain canals to cost $2,642,120 should be carried out.

There are two projects for the enlargement of the Erie Canal to be considered by the State.

(a) To complete the project of 1895 with modifications, giving 9 ft. depth and lengthening the locks on one tier to pass two boats, each of these boats to be 125 ft. long, 17½ ft. beam and 8 ft. draft, with a cargo capacity of 450 tons; lengthening the locks on the other tier to pass one boat; mechanical lifts and certain new locks to eliminate 21 existing locks; a new canal from near Clyde to New London, 81 miles, giving a waterway through the Seneca and Oneida rivers and Oneida Lake; the use of the Mohawk River for the canal from Cohoes to near Schenectady; a new canal from the Falls of the Mohawk near Cohoes to the Hudson River near West Troy, this to cost $21,161,645.

(b) A second project, to build a canal along the same route, but large enough to carry boats 150 ft. long, 25 ft. beam and 10 ft. draft of 1,000 tons capacity. The canal should be 12 ft. deep and 11 ft. in the locks and the locks large enough to pass two boats at one lockage, the cost to be $58,894,668.

The committee decides with some reluctance that the State should undertake the larger of these two projects, as the smaller one would be but temporary and the larger one probably permanent. The committee advises, further, an appropriation of $20,000 for surveys and says that the work could be done so as to be available for the season of 1905.

(4) The money for these improvements should be raised by the issue of 18-year bonds.

(5) The efficiency of the canals depends upon their management as much as upon their size, and no money should be spent for enlargement unless

(a) restrictions are removed as to the amount of capital of companies engaged in transportation on the canals.

(b) Mechanical traction should be used and mechanical power for the gates and valves.

(c) The permanent force should be so organized as to afford an attractive career for young engineers.

(d) The laws of the State should be revised so as to make impossible a repetition of the unfortunate results of the $9,000,000 appropriation.

The committee then takes up a discussion of the question whether or not the canals should be abandoned. It is admitted on all sides that the canals have been of great use in developing the city and State of New York, but an argument is made that improvements in methods of equipping and working railroads will reduce the cost of transportation by rail below that possible by canal. It has been said that the New York Central and other railroads, on the completion of engines designed to haul trains carrying from 2,000 to 2,400 tons of paying freight, will reduce the rate on grain, ore, etc., to one mill per ton-mile. The committee has inquired especially as to this matter from the presidents of the New York Central, the Illinois Central and the Pittsburgh, Bessemer & Lake Erie. Mr. Fish says that there is no probability of a rate of one mill per ton-mile in the near future. Mr. Callaway's reply leaves no doubt that the New York Central has no expectation of quoting any such rate. Mr. Reed says that ore has been carried from Conneaut to Pittsburgh the past summer at an actual cost for transportation alone of 1½ mills per ton-mile, the freight rate being 3.65 mills per ton-mile. The committee considers it more than probable that when grain has been carried at 2¼ mills per ton-mile it has been done at a loss, and reasons that railroad rates must be higher in the future rather than lower, and that it is very doubtful if, even when the next business depression comes, railroad rates will again go down as low as they have been in recent years.

The committee judges that water transportation is inherently cheaper than rail transportation. On the ocean it averages half a mill per ton-mile and on the Great Lakes about 6/10 of a mill. It is believed that the canal rate, after the improvement suggested, can be reduced to two-thirds of a mill per ton-mile, or close to the lake rates. It is argued that even if rail rates can be brought still lower, yet, by corresponding skill in working canals, canal rates also can be brought lower, as can lake and ocean rates.

Furthermore, it is argued that with the canals enlarged and properly managed, they can compete for freight paying higher rates than that which they are now obliged to carry, and that an enormous development can be given to their local traffic at profitable prices.

With an enlarged canal, fleets of four to six barges of 1,000 tons each can be moved from the lakes to the seaboard, and distributed along the Atlantic coast to points anywhere from Boston to Philadelphia. The use of barges and detached motive power in coastwise traffic has now reached enormous proportions and the canal fleets can be used that way. If the water route is abandoned New York must compete by rail with all other Atlantic Coast ports, and, furthermore, it must face the competition of the St. Lawrence route.

The committee devotes particular attention to the probable development of the manufacture of steel and iron at Buffalo, along the canal, and about New York Harbor if the enlarged canal is provided. Indeed, the committee believes that this use of the canal would justify the enlargement quite as fully as its original construction was justified for transporting breadstuffs and foresees that the Pittsburgh district would find an Atlantic outlet by rail to Lake Erie and thence through the canal.

The committee disapproves entirely of the ship

canal project. "There are certain insufferable difficulties in the way of such a canal being a success, no matter by whom constructed." Ocean going steamers cost $71 per net ton of carrying capacity, lake steamers $36, and a canal fleet, such as contemplated for the enlarged canal, being a steamer and three consorts, would cost $7.31 per ton of carrying capacity. Furthermore, the average speed of ocean going or lake steamers through the Erie Canal could not exceed five miles an hour. Therefore, they could not carry freight through the canal at anything near lake and ocean rates.

The estimates of the probable cost of the enlarged canal as recommended by the commission have been carefully made, and the data collected by the Board of Engineers on Deep Waterways, although not public nor yet presented to Congress, were put at the disposal of the engineers of this committee. The committee also employed its own engineers, Messrs. G. W. Rafter, D. J. Howell and F. M. Sylvester, to collect further data and to make estimates which were made under the personal direction of Major Symons and were then submitted to Messrs. William H. Burr, William Barclay Parsons and George S. Morison. The estimates have been approved by Messrs. Burr and Parsons so far as it was possible for them to express an opinion. Mr. Morison was abroad and therefore could not pass on them.

An important chapter of the report is devoted to the subject of management, in which the Committee again expressses the opinion that the same business methods which have been applied with such success to railroads can be applied equally well to canals and will produce results as satisfactory. To bring this about, however, that clause of the laws of 1896 which limits the amount of capital employed in canal transportation must be repealed. The clause is "no corporation organized under this act and designed to navigate any of the canals of the State shall not have a capital stock exceeding $50,000."

The next step is the reduction of terminal charges at Buffalo and New York. The Committee does not think that it is necessary to try to bring this about by legislation, but if the canal is established and the law limiting the capital stock that may be employed in working the canal is abolished, elevator charges and the like will be reduced for business reasons, and it is believed that responsible companies, with adequate capital, will take charge of grain at Chicago or Duluth and deliver it in the hold of ships at New York, using their own property all the way.

The appendices to this report cover a report on European canals by Mr. Witherbee; estimates of cost of transportation and of cost of enlargement by Major Symons; reports and estimates of the engineers employed; a memorandum on the method of bidding to prevent unbalanced bids, and other matters including a mass of statistical tables and data relating to canals and to the commerce of New York prepared by John A. Fairlie, Ph. D., Secretary to the Committee. Mr. Fairlie's appendix covers 85 pages, besides numerous charts, and gives a great mass of information as to traffic movement, freight rates and other matters.

A table of the cost and value of the canal, according to different projects, has been prepared by Major Symons and is given herewith.

Cost and Value of New York State Canals.

	Present Erie Canal.	Erie Canal completed in accordance with project of Canal Committee, for use by boats 125 ft. x 17½ ft. x 8 ft. draft.	Recommended canal for barges 150 ft. long, 25 ft. wide and 19 ft. draft.
Cost of transporting a ton of freight between Buffalo and New York	87 cents.	44 cents.	26 cents.
Cost of transporting a bushel of wheat between Buffalo and New York	2.62 cents.	1.32 cents.	.80 cents.
Cost per ton per mile	1.75 mills.	.88 mills.	.52 mills.
Assuming a tonnage of 10,000,000 tons annually the cost of transporting it between Buffalo and New York would be	$8,700,000	$4,300,000	$2,600,000
Under above assumption, the annual saving in cost over present Erie Canal would be	.....	4,500,000	6,100,000
Relative cost of transportation, assuming that by present Erie Canal as unity	1.00	.50	.30
Relative value of canals considering cost of transportation simply; present Erie Canal as unity	1	1.98	3.34
Assuming a tonnage of 10,000,000 tons annually with the saving in cost of transporting as indicated in this table, and, money at 5 per cent., the economic value of the different size canals over the present Erie Canal would be	.....	$86,000,000	$122,000,000
Estimated cost of completing the Erie Canal to the extent indicated	.....	21,191,645	58,894,668

Report of New York Commerce Commission.

The special commission appointed by the Governor of New York in 1898 to report on the condition of commerce of New York City has made its report to Governor Roosevelt; and in a message to the Legislature the Governor endorses the recommendations of the Commission, except that in the matter of the enlargement of the Erie Canal the Governor approves of the more extensive plant of the Canal Committee.

The Commerce Commission was composed of Chas. A. Schieren, chairman; Andrew H. Green, C. C. Shayne, Hugh Kelly and Alexander R. Smith, and reports of its hearings have been given from time to time in the Railroad Gazette. What follows is a brief condensation of the report now made. The language is our own, but we have tried to give the Commission's findings.

The Commission has held 32 public sessions and has examined over 100 witnesses. It finds that the foreign commerce of New York City has declined during the past 19 years, and it is believed that the principal cause of this is the differential rates agreed upon by the Trunk Line railroads, by which freight from the West is carried cheaper to other ports. Exporters without exception testify that the differential has operated with increasing severity for more than six years. The existence of the differential shows that freedom of competition would inure to the benefit of New York, and its maintenance is a crime against the commerce of the nation. The New York Central is a party to the agreement, and as that company has received great benefits from the State, it should be looked to for relief. New York City should take drastic measures, if necessary, to stop this discrimination. If the Southern roads knew that the Central would never again participate in an agreement, the differential would at once vanish. The Central should have tried to secure a judicial decision condemning the differential.

The first remedy to be adopted by the State is to insure competition; and to do this it should spend the 15 millions necessary to carry out the enlargement of the Erie Canal which was begun under the act of 1895. Then boats carrying 30,000 bushels of grain could come to New York. Another demand of commerce is ample and shedded piers at New York and Buffalo, to be used as terminal freight houses for the canal boats. Without these the canal can carry nothing but grain and the railroads are thus able to concentrate their competition on one commodity. With adequate terminals Minneapolis and Duluth would ship large quantities of flour by canal. Another evil is the combination of grain elevators at Buffalo. Most of these, being owned by the railroads, combine to kill off the business of elevators which are connected with the canal, but not with railroads. The State must furnish elevators to give cheap service to the canal boats. The Champlain Canal should be deepened to seven feet. The law limiting the capitalization of canal boat corporations to $50,000 should be repealed. Certain port charges in New York are excessive. The railroads will not let grain go through their New York elevators without an arbitrary charge of one cent a bushel. By this they have driven away from the port all of the full-cargo business, and now New York has no advantage in ocean rates, but probably a disadvantage. The State should, by law, limit the elevator charge at both Buffalo and New York to half a cent a bushel, which rate would be ample for all services performed in connection with elevating grain. The books of the elevators at Buffalo and of the Floating Elevator Co. at New York support this statement. The lighterage charge in New York, three cents per 100 lbs., is absorbed by the railroads. The Commision appears not to have been able to form an opinion as to whether this charge is excessive.

The docks of New York are inadequate. Foreign steamships are able to secure only nine per cent. of the available water frontage, while the railroads have 34 per cent. The improvements made by the National Government around the Harlem River will benefit foreign commerce, but laws should be passed to favor the improvement of land under water. Owners of adjoining uplands should be allowed to lease and improve submerged lands on favorable terms.

The report closes with a summary of the recommendations outlined in the foregoing paragraphs. The clause relating to docks recommends the amendment of the charter of the city so that the canal piers, so called, shall be used only by barges coming from north of Castleton. It is recommended that the Legislature annually authorize the city of New York to build new piers, as required; and especially that the dock board should promptly acquire land necessary for the improvement of the North River front between Gansevoort and Twenty-third streets.

The Production and Use of Gas for Power.

Under date of Jan. 9, Mr. George Westinghouse sent the following letter to the New York Times:

The bringing together of the gas and electric light and power interests in New York should result in great advantages to the public and to the interests so combined, provided the latest developments in gas and electric engineering are investigated and availed of.

Among the numerous questions affecting the health, comfort, and convenience of the citizens of New York (and of all communities, in fact) are three of especial importance, viz.:

The disposal of garbage, the abatement of the smoke nuisance due to the increasing use of bituminous coal for steam power purposes, and the securing of an adequate supply of water.

From statistics there appear to be created daily in New York about 500 tons of garbage, or at the rate of one-half pound per capita. Such garbage is about 20 per cent. carbon and 80 per cent. water. By a process which has been well demonstrated on a small scale, and which is being rapidly brought to a commercial basis, all of this garbage can be economically, and without offensive odor, converted into a fuel gas of great value. In the same apparatus and by the same process soft coal can be made into a gas suitable for power and heating purposes.

The fuel gas made from garbage and soft coal can be used to drive gas engines with electric generators, and the electricity thus produced can be used for light and to drive motors to the exclusion of the thousands of steam engines and boilers which make such demands upon the water supply, since the gas engine central station can be so located that the water needed for engine-cooling purposes can be taken from the river.

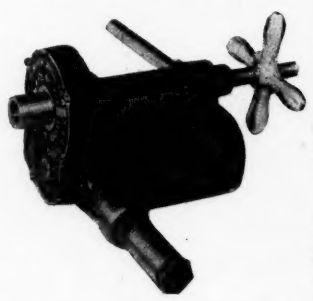
Bearing upon these questions, and of especial importance, are the partially executed plans of the electric power and light corporations, viz.: the Metropolitan, Third Avenue, and Manhattan Elevated Railroads and the New York Gas and Electric Light, Heat and Power Company and the United Electric Light and Power Company. If their present plans, which are fairly well known to the engineering profession, are carried to completion, each will have one large steam station on the East River between 29th St. and the Harlem River, with about 75,000 h. p. of engines, boilers, and electric machinery, making an aggregate of 375,000 horse power, which may be largely increased when the underground rapid transit railroad is completed, and still further when the electric locomotives is used on all steam railroads within the city limits.

If these corporations, which might as well buy electricity as the machinery, coal, and water with which to produce it, were to unite in a common plan to provide the electricity needed in their operations by the adoption of the best available mthods, the saving to each in capital expenditure would be very great, and the decreased cost of their supply of electricity would make an important addition to their earnings applicable to the payment of dividends; while, most important of all, the citizens of New York would have solved for them the garbage, smoke, and very largely the water questions.

I believe the contemplated plans of the corporation above named, which can be shown to be based upon an imperfect knowledge of the subject, will stand in the way of vast public interests, and, so believing, I have said to representatives of some of those companies that the near future would demonstrate the projected power stations and systems of electrical distribution incidental to the character of such stations, to be as far from the best as are the old cable systems for the propulsion of cars.

Monarch No. 4 Piston Air Drill.

The Standard Railway Equipment Company has brought out a new piston drill known as the Monarch No. 4. This is built on the same lines as all the drills of that company, having a solid three-way crank and ball bearings. The pinions are of tool steel. This drill measures 12 in. from the end of the spindle to the end of the feed screw and can be used within 2½ in. of a corner. It is well adapted for boiler work, being reversible, and can be handily used for tapping staybolts or running them in or out. It has a standard socket for machine bits and can be readily converted into a wood boring machine.



The engine part is entirely separate from the spindle, which is claimed as an advantage over other drills, as strain on the spindle does not affect the driving parts. The reversing throttle and starting throttle are one. To reverse the machine it is only necessary to turn the throttle past the inlet ports and connect with ports that act as exhaust ports when the machine is running forward. The machine is provided with a lock, so that it can be set to run only in one direction, which is often desirable when running in a machine shop. This new drill weighs 18 lbs. and will drill up to 1¾ in. diameter. It has a feed screw length of four inches.

An Automatic Recorder of Emergency Brake Applications.

The automatic recorder of emergency brake use here illustrated is the invention of Mr. W. E. Symons, Superintendent of Motive Power of the Plant System. It is intended to register all emergency applications of the brake, but does not record service applications. It is attached to the engineer's valve. The following are ten requirements laid down by the inventor as necessary to insure the successful introduction and working of an emergency recorder, and it has been his aim to meet all of these.

1. It must not interfere or impede in the least the application of the brakes to either light engine or train, that is, it must not affect the sensibility of the brakes by impeding either the preliminary or emergency exhaust.
2. It must be automatic.
3. It must record each emergency application made, whether engine is attached to train, or handled light.
4. It must not operate when service aplications only are made.
5. It must not make a record of the times the engineer's valve handle is placed in emergency position when there is no air on the engine.
6. It must not operate when a hose bursts or the conductor applies the brake from rear of train.
7. It must make its record in such a manner as to defy its being destroyed.

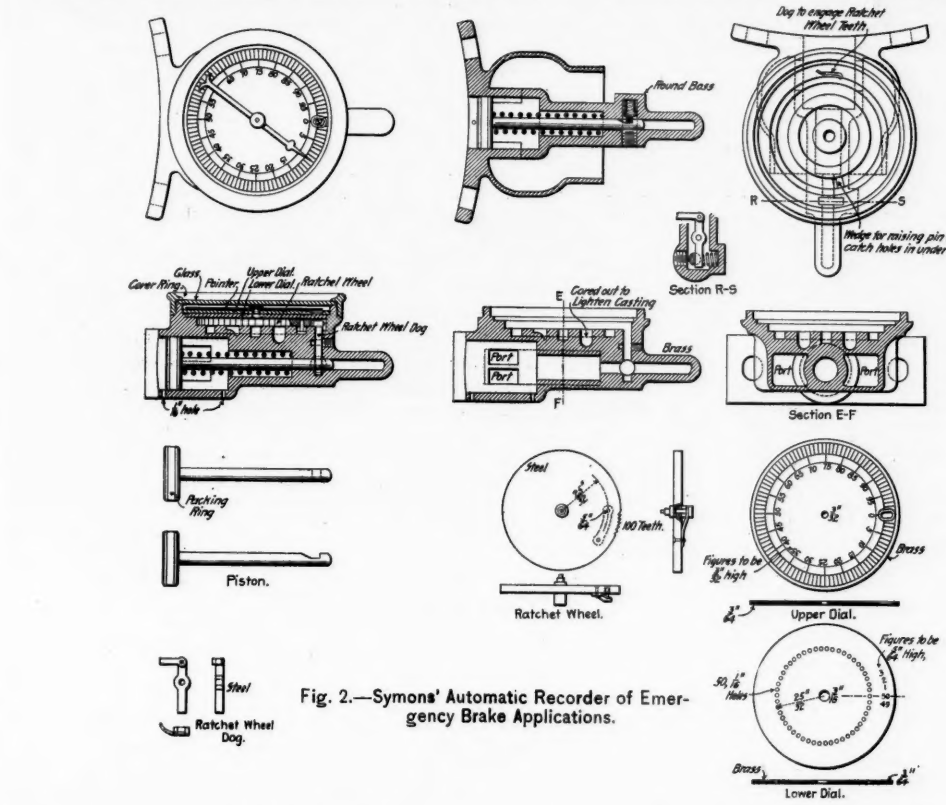


Fig. 2.—Symons' Automatic Recorder of Emergency Brake Applications.

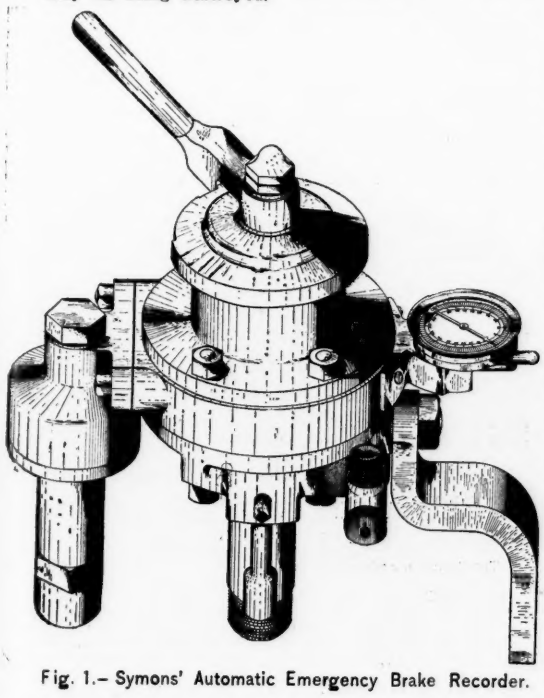


Fig. 1.—Symons' Automatic Emergency Brake Recorder.

8. It must be so constructed as to evade any attempt on the part of the person in charge of engine to change the record when once made, or to prevent a record being made when once the forbidden position is reached.
9. It must be cheap, easily applied, simple and durable.
10. It must be capable of being applied to all engineers' valves on the market, without having to alter their design.

The instrument here shown records from one to 5,000 emergency applications, but it may be made, if necessary, to register more than this. It does not in any way interfere with the working of the air brakes, and makes no record of the service applications; no record will be made unless there is air in the reservoir, nor when a hose bursts while the engine is carrying air. It cannot be tampered with and so be made to give false readings. The instrument is simple, and will fit any valve with a slight change of the base.

The accompanying illustrations are sufficiently complete to make it unnecessary to explain in detail the construction of the instrument. The recorder is fastened to the engineer's valve, as shown in Fig. 1. The packing ring (Fig. 2) fits into a short cylinder, its movements being governed by the exhaust air and a spring. On an emergency application, the exhaust air pressure forces the packing ring and the piston in, and the notch on the piston in its return movement engages the ratchet wheel dog and the ratchet wheel is moved one notch. Attached to this wheel is a pointer which moves over the face of a dial graduated for 100 applications, as shown in the upper left hand corner of the illustration. Under this dial is another one shown in the lower right hand corner in the engraving. When one complete revolution of the upper one has been made, thus indicating 100 emergency steps, the under dial is pulled along one point, thus recording the number of complete revolutions of the upper dial. In the illustration, the figure 20 indicates that 20 complete revolutions have been made and the number of applications tions read from the instrument in the illustration would be 2,010.

The instrument is sold by T. N. Motley & Co., 43 John St., New York.

Locomotive Fuel Accounts.

Mr. C. C. Bonte, of the Southern Pacific, discussed the subject of accounting for coal used for locomotives, at a recent meeting of the Pacific Coast Railway Club. He said, in part:

It would seem that any system of accounting for coal by weight as delivered to tenders would necessarily be more accurate than by measurement. But the expense of equipping coaling stations with weighing apparatus is so large that railroads may well consider whether mere accuracy in accounting will recompense them for the investment, cost of maintenance and operation. On the Pacific System of the Southern Pacific the investment would aggregate $100,000, if track scales, which can be used in conjunction with coal piles, were used.

Track scales would seem to be as accurate a method of weighing as any. We find, however, that the difference in weight of coal as delivered from the ship to the bunker by custom-house officials will frequently vary as high as 150 tons per cargo from the weight of the same coal on track scales after having been loaded into cars. With a view to determining the reliability of track scale weights, a tender with coal and water was weighed on the same scales in fourteen different positions, resulting in fourteen different weights, with a difference of 2,840 lbs. between the heaviest and lightest weight. It may be argued that, the position of tender on the scales being the determining factor, more accurate results could be obtained by the use of platform scales in weighing from bunkers or coal pile to the tender. Platform scales cost less as a first investment; the cost of operation, however, is much greater, as by this method each tub is weighed separately instead of the entire contents of the tender, as is the case with track scales. This method of weighing has been tried at various times at nearly all coaling stations, with varying results. The number of scales, the degree of care and the time necessary in weighing, and the fact that at terminal coal stations this work must be done in the shortest possible time have prevented its general use. Where the weighing is carelessly done, the results are far from good and are frequently misleading. When done under average conditions, results are not sufficiently accurate to be satisfactory. At a certain coaling station during the past five months a number of tubs of coal of the same kind were weighed at intervals, by the same men, under the supervision of the same forman, with the following result: The lightest tub weighed 988 lbs.; the heaviest, 1,170 lbs.

As at nearly all fuel stations coal is necessarily handled in tubs for the purpose of conveying to the tender, it would follow that no added cost is necessary to account for the contents of tubs by cubic measurement. The great objection to this method is approximating the weight of coal in a tub; the several kinds of coal used do not average the same weight per cubic foot and the same weight of coal in lumps cannot be placed in a tub as of fine coal. Notwithstanding these objections, the net result on the Southern Pacific has been more nearly correct than that obtained by actual weighing. This in a large measure is owing to the adoption of a standard weight per tub for coal at different stations, this standard being the result of numerous tests, extending over a period of many years.

Another method is that of attaching a gage to each tender, by which the coal delivered can be measured. This method demands additional labor to level and measure such coal as may be on a tender before further coal is added, and again after further delivery is made; and is open to the further objection that coal remaining on tender at the ends of a trip weighs more per cubic foot than that freshly added. It is admitted that for the purpose of comparing the performance of locomotives the last-named objection does not hold with equal force; however, there exists a large difference in weight obtained by this method and measurement by tub. Some time since the total amount reported under the former method as consumed by a certain lot of seven locomotives in freight service, during a period of two months, was approximately 1,000,000 lbs. less than by the latter method; this large difference was not, however, wholly due to the objection referred to, as it was partially accounted for by the failure of engine men to properly report coal taken by them at way stations.

A simple, inexpensive, and approximately accurate method for accounting for coal consumed under ordinary existing circumstances is to establish an average weight per tub for use at stations where tubs are used, on the basis of the total weight of coal actually consumed at such stations during any certain period, divided by the total number of tubs handled at such stations during same period. Where possible, have the coal piled within defined limits in yards, or bins made to hold an approximately known quantity, so that an inventory can be simply and speedily obtained at stated intervals; hold the master mechanic or other authority as responsible for correct accounting for coal as for economical consumption by locomotives, based on the amount of coal delivered at coaling stations less the inventory. Shortage or overweight in the coal balance can then be readily adjusted by loading the tubs with more or less coal than has been the previous custom. The method of weighing or measuring may be ever so accurate, but the consumption of coal will not be satisfactorily accounted for unless deliveries are properly reported; therefore, when coal is delivered by the hostler or someone in charge of the fuel station, his report should be final; for, as a rule, reports made by enginemen are not reliable. Especially is this so under the system of rotating locomotives; the enginemen have not the same interest in making an economical showing for each of the many locomotives they handle, and take less interest in accounting for the fuel they use; in fact, they frequently fail to make any report. Where a premium is paid, or reward of merit is the result of economy in fuel consumption, self-interest may lead an engineman to err and not strictly account for all consumed.

Foreign Railroad Notes.

The German railroads are having a growing traffic. For the six months ending with September their earnings per mile increased 3¼ per cent. If this is much less than the growth here, it must be remembered that there was no such decrease there after 1893 as there was here.

It is reported that the locomotive works of the Hungarian State Railroads have taken a contract to build 14 locomotives for the Bulgarian State Railroad—which does not seem probable.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

PUBLISHED EVERY FRIDAY.

At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to improvements. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

The total number of cars ordered during the month of January and noted in our news columns was 5,524, and the number of locomotives ordered was 165. Of the cars ordered, 2,445 were box, stock and furniture cars; 1,770 were coal, ore and gondola cars; 954 were flat cars; 300 were steel cars and 55 were for passenger service. Of the 165 locomotives ordered, 37 were for export, and the division of types was approximately 84 freight, 63 passenger and 18 switching locomotives. The falling off in orders for rolling stock as shown by this record is very marked. The locomotive orders are the smallest since July of last year and the car record is the smallest since June, while not since July has the number of cars ordered in any one month been less than 10,000. There seemed to be no haste about placing orders, and complaints of a shortage of cars have not been so numerous of late. In several instances it has been announced that orders would be postponed or abandoned altogether on account of the high prices. In some quarters there is a feeling that prices are more likely to be lower in the near future than to hold their own or to advance. But, on the other hand, car and locomotive builders have orders booked which will keep them busy for several months, and satisfactory deliveries are hard to obtain. The indications are that the February orders will largely exceed those placed last month.

We publish in this issue an abstract of the two reports which have been presented to the Governor of New York on the canals and commerce of the State. The report of the Schieren Commission (whose inquiries have been reported from time to time in the Railroad Gazette) is quite overshadowed by the much more thorough report of the Canal Committee, and, under the circumstances, it is only the latter that demands much discussion. This discussion we shall have to defer to a later issue; but there is one point in the Schieren report which may be mentioned now; not for discussion, but merely that the facts may be set forth. We refer to the allegation that the New York Central (and the other New York roads) are parties to an agreement on differential rates. The members of the Commission seem to believe that the roads still maintain the differentials on grain rates, as between New York and the cities to the south of her, and everybody is taking the Commission's word for it. Now, if there is any such agreement, the courts will annul it in a minute, on the same ground that they killed the Joint Traffic Association; yet the Commission, recommending several bills for legislative action, makes no suggestion concerning this matter. The report confines itself largely to rebuking the New York Central for not getting the courts to decide that the roads to Baltimore, etc., shall not carry grain to the sea coast cheaper than the Central carries it. A more difficult subject on which to secure effective judicial or legislative action could hardly be imagined. The fact is, that the differential agreement lost all binding force when the Trans-Missouri decision of the Supreme Court took effect; and whatever the Central has done since then in the way of maintaining rates higher than those of its competitors, must have been done solely in the interest of the Central road; and, as Mr. Callaway has said, with evident sincerity, the Central cannot be other than friendly to New York City in everything it does concerning freight rates. Moreover, it is generally admitted that up to the end of 1898, the roads leading to New York were all the time violating the differential agreement—were secretly giving to exporters the same rates that were in force to Baltimore or Newport News; and yet the proportion of grain coming to New York continued just about the same. The Commission evidently is deceived by the discussions of the past few years concerning tariffs, forgetting that tariffs and actual rates have been two different things. If the differential has hurt New York, the damage must have been mostly done during the past twelve months; but this is just the period when the argument about New York's losses has the hardest work to find facts to justify itself.

On Certain Terminal Stations.

A few years ago (August 9, 1895, to be precise) we undertook to lay down one fundamental principle of passenger station design, namely, that the first duty of a station is to be convenient. We pointed out that pretty nearly every one of the recent costly modern stations in the United States was designed and used so as to be in certain important respects about as inconvenient as possible to the large majority of its users. A common idea running through all of them is to have one great waiting room, not only as a waiting room, but as a common passageway for those who use the station, as a ticket office and as a bazaar for the sale of general merchandise. And, further, all those who use the station must, as a rule, pass through this waiting room; or, if they are not obliged to pass through it, still it lies in the direct line of travel, so that in fact they do pass through it to the discomfort of those who must use it as a waiting room.

The exits from this main waiting room, while perhaps sufficient for the middle of the day, when infrequent trains are going, are inadequate for the crowded hours, when the throng of suburban passengers is moving. The ticket windows are generally too few for the crowded hours and often are accessible only in the waiting room. Finally, when passengers have emerged from the waiting room through the rear doors and reach the space now commonly known as the midway, they are confronted by a fence with narrow wickets through which they must crowd, one by one, to reach the train platforms.

We shall not now repeat the names of examples of bad design which were mentioned in the article to which we refer. Everyone who travels at all is familiar with them. They exist in all our cities and yet are hardly ever to be seen on the other side of the Atlantic.

This subject is again brought to mind by a recent visit to Boston and by a few hours spent in the two new stations, there the North Union and the South Terminal. The North Union was mentioned in the earlier article as an example of good design. The South Terminal had not then been built.

This latter station is now in use, and taken all in all, it is the best station that we have ever seen. The waiting rooms are off the direct line of movement. From the street one goes direct, by spacious entrances, to the midway. Here he finds ticket windows enough to serve any number of passengers who are ever likely to use the station. These ticket windows are not all manned, but they are ready if needed, and the same ticket offics have windows in the waiting room. Opening directly on the midway are lavatories, parcel room, telegraph and telephone offices, baggage room and the station master's office, and in the midway are a cigar stand, a newsstand and a waiting room for station porters. Opening off to the left are waiting rooms, lunch room and the lifts to a quiet restaurant on the second floor. To the right are the train platforms. The gates by which these are reached are 12 ft. wide and there is no inspection of tickets. The circulation is perfectly free, and, further, there are no bellowing ushers to cry the trains. A large indicator at each gate shows the time of departure of the next train and the stations which it reaches. A uniformed attendant is at the gate to answer questions, but he does not hinder you or make a noise.

We need not stop now to specify the many other conveniences of this station, but one can ascertain these from a study of the several articles descriptive of it which we have published in times past and by reading the admirable description recently published by Mr. Francis, Resident Engineer of the station, in the December Proceedings of the American Society of Civil Engineers. We are writing now merely to call attention to the one great convenience of the free movement of passengers.

At the North Union station we find the same provision for free circulation. There, also, one may go to the midway by an ample passage without going through the waiting room, although there the main waiting room is so placed that there is considerable passing through it. There also one finds a good provision of ticket windows and an ample midway, and he can pass to the train without showing his ticket.

In one way the Boston & Maine, which uses the North Union station, is more like a British railroad than is any other railroad in the United States. It has many branches and junctions, and to one not very familiar with the territory and train movements the geography is confusing. Here is an excellent chance for the traveler to go astray, and yet here the superstition of ticket inspection no longer exists. The passenger goes out through a wide gate unchallenged, and here one sees a practice which no doubt helps much to save mistakes. The cars are "carded." On the side of each car, near its ends, are hooks on which are hung cards bearing the names of the stations to which that car is destined. If a man can read there is no excuse for getting on the wrong car.

At both of these stations we were told that there is seldom any trouble arising because tickets are not inspected, and there was a pretty definite feeling that the passengers at those stations would not stand such obstruction. Two great results seem to be reached successfully in these two Boston stations. First, crowds can move freely to the trains without local congestion; second, people waiting in the waiting rooms can have quietness, cleanliness, good air and uniform temperature, which are possible only when those rooms are used as waiting rooms and not as thoroughfares for the crowd.

December Accidents.

Our record of train accidents in December, given in this number, includes 127 collisions, 105 derailments and 4 other accidents, a total of 236 accidents, in which 65 persons were killed and 171 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

COLLISIONS.

	Rear.	Butting.	Crossing and other.	Total.
Trains breaking in two	15	0	0	15
Misplaced switch	1	4	2	7
Failure to give or observe signal	5	1	5	11
Mistake in giving or understanding orders	0	3	0	3
Miscellaneous	7	4	9	20
Unexplained	29	9	33	71
Total	57	21	49	127

DERAILMENTS.

Broken rail	1	Misplaced switch	2
Loose or spread rail	2	Derailing switch	2
Defective bridge	1	Track repairers	3
Defective switch	5	Bad switching	1
Soft roadbed	1	Unfastened switch	1
Broken wheel	5	Animals on track	4
Broken axle	13	Landslide	2
Broken truck	5	Malicious obstruction	1
Fallen brakebeam	3	Unexplained	45
Brake hose burst	1		105
Failure of drawbar	3		
Loose ashpan	1		

OTHER ACCIDENTS.

Boiler explosion	3
Cars burned while running	1
	4
Total number of accidents	236

A general classification shows:

	Collisions.	Derailments.	Other accid's.	Total.	P. c.
Defects of road	0	10	0	10	4
Defects of equipment	15	31	4	50	21
Negligence in operating	41	12	0	53	22
Unforeseen obstructions	0	7	0	7	3
Unexplained	71	45	0	116	50
Total	127	105	4	236	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other accid's.	Total.
Passenger	51	16	4	71
Freight and other	183	91	0	274
Total	234	107	4	345

The casualties may be divided as follows:

Killed.	Collisions.	Derailments.	Other accid's.	Total.
Employes	31	15	0	46
Passengers	8	3	0	11
Others	5	3	0	8
Total	44	21	0	65
Injured.				
Employees	72	21	5	98
Passengers	49	17	0	66
Others	0	7	0	7
Total	121	45	5	171

The casualties to passengers and employes, when divided according to classes of causes, appear as follows:

	Pass. Killed.	Pass. Injured.	Emp. Killed.	Emp. Injured.
Defects of road	0	0	0	4
Defects of equipment	3	13	1	7
Negligence in operating	8	51	38	77
Unforeseen obstructions and maliciousness	0	0	4	4
Unexplained	0	2	3	6
Total	11	66	46	98

Thirty-seven accidents caused the death of one or more persons each, and 49 caused injury but not death, leaving 150 (64 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with December of the previous five years shows:

	1899.	1898.	1897.	1896.	1895.	1894.
Collisions	127	106	107	29	72	66
Derailments	105	107	95	60	79	69
Other accidents	4	7	6	6	6	7
Total accidents	236	220	208	95	157	142
Employes killed	46	25	18	43	41	24
Others killed	19	7	10	19	7	5
Employes injured	98	127	135	53	84	58
Others injured	73	56	60	37	115	32
Passenger trains involved	71	65	66	26	56	58
Average per day:						
Accidents	7.61	7.10	6.71	3.06	5.06	4.58
Killed	2.10	1.33	0.90	2.00	1.55	0.94
Injured	5.51	5.90	6.29	2.90	6.42	2.90
Average per accident:						
Killed	0.28	0.15	0.13	0.65	0.31	0.20
Injured	0.72	0.88	0.94	0.95	1.27	0.63

Of the 11 passengers killed in train accidents in December six are charged to the rear collision at Salida, Colo., on the 4th. The circumstances of this collision, as reported, indicate that the case afforded a more than usually striking illustration of the need of the block system. In the rear collision at Boston, on the 16th, however, we have an instance of a collision of passenger trains, fortunately not disastrous, where the block system was well maintained. It seems quite likely, however, that the lack of a distant signal should be set down as a chief element in the cause of this collision. Unremitting strictness of discipline will, no doubt, make enginemen slacken speed at home signals every time that fog or smoke interposes a liability that the signal will not become visible soon enough to permit shutting off steam and stopping after it is seen; but practically no one has found it expedient to maintain such a high degree of discipline, except where trains are so numerous and frequent that the exigencies of the service itself help to enforce discipline; so that a distant signal, making it easier for the engineman to obey his orders and at the same time maintain his schedule, is the rational remedy. In this case the foremost train would have been protected by an overlap circuit, if there had been one, for it was standing in just the situation that overlap circuits are designed to provide for; but it is to be observed that a curved line, with numerous parallel tracks, close to a very busy terminal, is just the place where the overlap would be likely to first show its weakness; the weakness inherent in the fact, known to all the enginemen, that it is established for the purpose of making it safe for enginemen to disobey the rule.

The disastrous collision of freight trains near Plainsboro, N. J., on the 12th, illustrates the vicissitudes of four-track railroad working. This accident was due to a cause very difficult to completely guard against—was as nearly unavoidable as any class of accidents connected with maintenance of equipment, and yet it was very costly. Another interesting freight train wreck was that at Kendrick, Idaho, on the 15th.

We have records of 21 accidents to electric cars in December, in which one person is reported as having been killed and 50 were injured. In seven of these accidents a car ran into a steam railroad train or was run into by a steam locomotive; and it was in one of these that the fatality occurred. In another one the electric power failed just as the car was crossing the steam railroad track, but, fortunately, the passengers had time to escape.

Anyone interested in the problems electrical engineers are working over will do well to read the extracts, printed elsewhere in this issue, from Mr. Doherty's address as retiring President of the Northwestern Electrical Association. Mr. Doherty is aware that the economical production of electrical energy depends on something more than merely a perfection of the electrical machinery, and he makes suggestions which may form the basis of a profitable study of the questions from many points. He notes the improvement in alternating current apparatus and methods, but thinks that central station practice can be considerably improved and urges, among other things, the selection of the best educated men possible for this work. These and other notes in the article on the progress of electrical engineering suggest to us that the gradual perfection of the machinery and the rigid requirements—as the demand for a constant speed—have done much to hasten the development of steam practice. This leads to a consideration of the question of the most economical prime mover for electrical machinery and calls attention to the possibilities of the combined producer gas plant and the gas engine. "Even under present conditions," Mr. Doherty says, "producer gas and gas engines will yield a mint of energy for the least consumption of fuel." If this be true—and as a general statement it is fair enough—the question naturally arises, Why are there not more than four or five central power stations in this country which have adopted gas engines as the prime movers? Until very recently, the engineer would have answered the question by saying that the machine was unreliable, and if no other reason were given, this would be sufficient to forbid its use for such exacting work as is required in the electrical power station. But that condition we may hope has passed, and we are only stating an obvious fact when we say the best gas engines are as reliable as the best steam engines. After looking at the question from many sides, we are led to believe that the commercial success of the best gas engines now rests more with the makers and sellers than with the designer, and if a greater economy is guaranteed than can be got with the same investment in a steam plant of equal output, the use of gas engines will be extended even so far as to satisfy the expectations of its advocates. This is not expecting too much, for in some installations it has been realized. At Jersey City, last year, a plant was put in for the Erie Railroad and its working shows that where the right kind of fuel is available, power from producer gas used directly in the gas engines can be had for about one-half the cost of the same amount of power produced by a good steam engine and boiler and at nearly the same first cost.

NEW PUBLICATIONS.

A Treatise on Masonry Construction. By Ira O. Baker, C. E., Professor of Civil Egineering, University of Illinois, M. Am. Soc. C. E., etc. Ninth edition, revised and partially rewritten. New York: John Wiley & Sons. London: Chapman & Hall, Limited, 1899. $5.

In the publisher's note we are told that the ninth edition is a great improvement over former editions. The chapter on cement has been entirely rewritten, and contains the latest results in manufacture and testing. The directions for testing cement are given in unusual completeness. The collection of specifications for the quality of cement has been considerably extended, and a set of specifications for delivery and storage of cement has been added. An entirely new chapter on sand, gravel and broken stone has been added. The author has made a careful study of a number of sands, and presents tables showing the effect of different sands upon the strength of mortar. He has also made a sieve analysis and determined the voids and weight of a variety of sand, gravel and broken stone; and shows the bearing of these results upon the strength and economy of mortar and concrete. The chapter on mortar and concrete has been rewritten and nearly doubled in extent.

The first edition of Prof. Baker's admirable treatise appeared only ten years ago. At that time we said that "the latest and best engineering practice is fully and clearly detailed . . . thus placing in the hands of students and practical men a mass of material which has heretofore only been accessible in the files of technical journals or the transactions of societies. . . . This book is destined to be of much value to both students and engineers." The fact that it has passed into its ninth edition is reasonable evidence of the justice of that early estimate of its place in the literature of the profession, and it is hardly necessary to say more about a book so well known.

We are told that the chapter on cement has been entirely rewritten, as has the chapter on mortar, concrete and artificial stone. These two chapters now fill 105 pages and more than 30 pages of new material have been added. Furthermore, there is an entirely new chapter of 14 pages on sand, gravel and broken stone. By these revisions and additions the reader is again put in touch with the latest information and practice, and Mr. Baker's book remains, so far as we know, the best book on its special lines available to the student and the working engineer.

Associations of Superintendents of Bridges and Buildings.—The pamphlet proceedings of the ninth annual convention of the Association of Railway Superintendents of Bridges and Buildings, held last October in Detroit, is issued. It is printed at the Rumford Press, Concord, N. H., and the Secretary is Mr. S. F. Patterson, of the Boston & Maine Railroad, Concord, from whom copies can no doubt be procured. The discussion covered roundhouse smoke jacks and ventilators, cattle guards, the care of iron bridges and turn-table construction. The committee reports covered painting of bridges and buildings, life of timber in bridges, highway and farm crossings, sanitary arrangements at small stations, station pumping plants, the prevention of fire and bridge repairs without false works. The pamphlet contains the constitution and by-laws of the Association and list of members.

An Outline of Ventilation and Warming. By W. J. Baldwin, M. Am. Soc. C. E., M. Am. Soc. M. E., etc. Published by the author, 106 Beekman St., New York. Price $1.

Mr. Baldwin has long devoted himself especially to professional work as a consulting engineer in heating and ventilation and has written a book on "Heating" and one on "Hot Water Heating and Fitting," which are standards. His "Baldwin on Heating" has reached the 14th edition and his later book is in its third edition. The little volume now issued, which contains only 70 pages, is a good summing up of the fundamentals of the subject. It gives precise data of the quantity of air required in various buildings and of the fuel, boiler surface and radiating surface required for heating.

History of the Manufacture of Armor Plate for the U. S. Navy. Compiled by The American Iron & Steel Association, 1899.

This is a pamphlet of about 40 pages designed to set forth in a compact way the story of the growth of the manufacture of armor plate in our country. It is not technical, but rather commercial and political. The pamphlet describes particularly the Congressional history of the armor plate industry and the efforts to build up a Government plant and gives many figures of costs of plants and product. It is particularly well designed for the education of editors and members of Congress.

Creosoted Timber; Its Preparation and Uses. Published by The Haywoods, Philadelphia, 1899.

This is a little volume of 92 pages, obviously prepared to advertise the Norfolk Creosoting Company, of Norfolk, Va. It has a chapter on the Teredo, another on the Preservative Value of Dead Oil of Coal Tar, and one especially on the work of the Norfolk Creosoting Company. There are notes on the application of this method of treating wood for different purposes and a number of tables of more or less useful information. The works of this company are modern and have a capacity of 50,000 ft. B. M. daily.

Master Car & Locomotive Painters' Association. Proceedings of the 30th Annual Convention. September, 1899. Published for the Association by the Railroad Car Journal. New York, 1899.

This volume contains, besides the official report of the 30th anuual convention of the Master Car & Locomotive Painters' Association, a list of members, the constitution and by-laws of the Association and a list of the officers for 1899 and 1900. The Secretary and Treasurer is Mr. Robert McKeon, Erie Railroad, Kent, O.

TRADE CATALOGUES.

Railroad Water Supply.—The United State Wind Engine & Pump Co., of Batavia, Ill., sends a pamphlet of 48 pages, which ought to be an interesting document to put on the files, being illustrations and descriptions of tanks, pumps, cranes and engines for railroad water supply. Examples are shown of wooden tanks on steel towers, of windmills for pumping, of gasoline engine installations, steam pumps and even horse power. Various details of crane and tank fixtures are also shown, as the Halladay outlet valve, the Mansfield standpipe with balanced valve and the Ewart slow closing valve.

Freight Cars.—The Allison Mfg. Co., Philadelphia, sends us a collection of photographs with a little, more or less, descriptive text designed to advertise the product of that company. As our readers know, the Allison Company builds practically every variety of freight cars for railroads and makes a specialty of export trads. The engravings, from photographs, show something of the works and of the product, exhibiting a great variety of cars.

Messrs. Manning, Maxwell & Moore, 85 Liberty Street, New York, are compiling a new catalogue devoted exclusively to the illustration of iron working machine tools. Those who have new tools that they wish to have illustrated in this catalogue should immediately communicate with Manning, Maxwell & Moore at their New York office, marking their communication "Catalogue Department" to insure prompt attention.

C. L. Berger & Sons, successors to Buff & Berger, Boston, Mass., have just issued a very complete illustrated handbook and price list of engineers' and surveyors' instruments of precision. The pamphlet is bound in stiff covers and contains 213 pages.

The E. M. Dart Mfg. Co., of Providence, R. I., has issued a catalogue and price list of the several patented specialties made by the company, including the Dart union coupling recently illustrated in the Railroad Gazette.

Grade Crossings.

Mr. L. F. Lorree, General Manager Pennsylvania Lines West, lately delivered a lecture to the students of Rutgers College, his alma mater, on "The Grade Crossing Problem." Extracts follow:

The responsibility for the creation of grade crossings rests not unequally upon the State and upon the railroads. In America the Atlantic coast States were fairly well settled when railroad construction began, and there the majority of the crossings were established when the railroads were built. The streets and roads existed, and the railroads were allowed to cross them at grade when the method of crossing was cheapest or more convenient.

Throughout the balance of the country the growth has been coincident with the growth of the railroads. . . . The identical location of tracks which are now regarded as inimical to the best interests of the cities were, in many cases, granted as inducements to railroad construction. For this purpose streets were vacated and rights of way presented through the centers of towns. The responsibility, therefore, is a joint one. . . .

In this country the first intelligent inquiry into the grade crossing question was made by a commission appointed by the Legislature of Massachusetts in 1888. The commission classified the crossings as follows:

Class 1—Common country roads, having no buildings to be affected by any change which might be made.
Class 2—Country roads with buildings near.
Class 3—Village streets with rows of houses.
Class 4—Tracks running through village squares.
Class 5—City streets.
Class 6—Where several city streets join nearby to complicate the problem and the traffic is heavy.
Class 7—Cases where the crossings are complicated with canals or rivers or ponds in cities.

The law imposes upon every traveler, before crossing a railroad track, on the highway, to "stop, look and listen." It is worthy of notice that very seldom are children hurt at grade crossings, even those in the vicinity of large public schools, and this is because of their timidity and almost invariable use of due caution. If the requirements of the law are observed, necessity seldom exists for further action in classes one, two, three and four, unless view of the track is obscured.

A division of the expense between the State—with its subordinate corporations—and the railroads that puts more than half the expense on the railroads is, in my judgment, grossly inequitable.

Upon such improvements as the automatic couplers, the application of air brakes, the gradual erection of interlockings at railroad crossings and junctions, and the installation of block signals, the railroads will expend $775,000,000. Add to this sum $3,979,211,070, the estimated cost of abolishing all grade crossings, and we must contemplate an almost totally unproductive investment of $4,754,211,070, or 44 per cent. of the whole present capitalization of all the roads now in operation in the country. Can we afford such an investment? I think not. Competition is no longer confined to the individual, nor even to the community; it has become national in its character. In the race for commercial supremacy this nation is, at the present time, in the lead, and we must regard as a grave national peril anything that is likely to substantially increase the cost of transportation as such vast investments must necessarily do.

After all, the railroad is a gentle apothecary. In four years in the city of Cleveland, Ohio, 4,280 lost their lives through contagious diseases and from preventable causes, while only two people were killed on the grade crossings of the Pennsylvania Railroad, constituting one-third of all the crossings in the city.

When all the reasons that seem to make desirable the abolition of grade crossings have been marshaled into order; when those are struck out that have no existence in fact, and those are reduced to their true proportions that have been exaggerated; when we realize that the moving consideration is one of public convenience, and not one of public safety, we shall find that there will be but little work of this character for which we can find any economic justification. . . .

It is obvious, therefore, that the vast majority of crossings must remain unprotected; but this does not imply that they must remain unimproved. . . . An observation of the use of a large number of crossings leads me to the conclusion that not until the number of vehicles and pedestrians upon the highway reaches 3,000 daily is it necessary to examine into the necessity of throwing additional safeguards around the crossing. . . .

According to the Massachusetts Commission nearly all railroad casualties are popularly ascribed to the existence of grade crossings, whereas many causes contribute to such loss of life. It is the fashion to say that we can not for a moment balance human life against monetary expense, but after all, safety, in any degree, is relative, and the facts ought to be carefully determined and the responsibility placed where it belongs. . . .

The first step should be the prohibition of the creation of new grade crossings. The next step should be the definite abandonment of a very large number of existing crossings.

It would seem to be fair to all interests, and to work no hardship to the community, to definitely abondon at least 33 per cent. of the street crossings. In other cases a subway or bridge for foot passengers only can be substituted.

There remains, then, finally, the full use of the street at a grade separate from that of the railroad. It has been the experience of other countries—and will be our experience here—that the interruption to traffic on important thoroughfares in the larger cities, especially near yards and stations, finally become unbearable and compels the separation of grades; and this inconvenience is, after all, the prime consideration, rather than the alleged danger, which is slight and usually a mere pretext. . . .

In residential districts it is believed that track elevation of such a height as to cause but a slight depression in street crossings is the best method. In manufacturing districts the street traffic is not the paramount consideration; hence street grades may be steeper, to permit of minimum elevation of tracks, so that connections to industries may be maintained. . . . It has been the experience, broadly speaking, that track elevation has killed manufacturing districts.

In terminal districts the situation is vastly more complex than in either of the preceding classes. Passenger and freight terminals must be located as close as possible to the centers of business; consequently they are surrounded on all sides by expensive improvements. . . . It is probable that in terminal districts the viaduct system of separating the grades of crossings imposes fewer restrictions than the other methods.

In summing up I should say that in a residential district track elevation has a beneficial effect on city property. It cannot be too strongly emphasized that it is impossible to maintain an industrial district unless the tracks can be kept on the surface. Railroad operation is benefited by the abolition of the grade crossings across or near terminal yards.

Train Accidents in the United States in December.

COLLISIONS.

Rear.

2d, on Union Pacific, at Bushnell, Neb., westbound passenger train No. 1, while taking water, was run into at the rear by the fast mail train. A dining car was wrecked and one trainman was injured.

3d, on Southern Railway, near Greensboro, N. C., passenger train No. 33 ran into the rear of a freight train standing on the main track, badly damaging the locomotive. Two trainmen were injured, one of them fatally.

4th, 6 a. m., on Denver & Rio Grande, near Salida, Colo., narrow-gage passenger train No. 5, which had been unexpectedly stopped, was run into at the rear by a following standard gage passenger train, No. 15, and the rear car of the foremost train, a sleeping car, was wrecked. The car next ahead of this was also badly damaged. Six passengers were killed and six were injured. It is said that a brakeman went back to signal train No. 15, but that his lantern was not in good condition and was blown out by the wind. The road is crooked and this, with the roar of the water in the adjacent river, prevented the man from either seeing or hearing No. 15 until it was almost upon him.

8th, 11 p. m., on New York, New Haven & Hartford, at South Norwalk, Conn., a freight train broke in two and the rear portion afterward ran into the forward one, derailing six cars and damaging the station building. A man stealing a ride was fatally injured.

10th, on Philadelphia & Reading, near Bridgeport, Pa., a freight train ran into the rear of a preceding freight, wrecking the caboose. A man riding in the caboose was killed.

11th, 3 a. m., on Southern Pacific, near Sour Lake, Tex., a freight train ran into the rear of a preceding freight, damaging the engine and several cars. One trainman was killed and three others injured, one of them fatally.

11th, 4 a. m., on Union Pacific, at Grand Island, Neb., a passenger train ran over a misplaced switch and into some freight cars standing on the side track, making a bad wreck; engineman and fireman injured.

12th, 5 a. m., on Pennsylvania road, near Plainsboro, N. J., a westbound freight train running on track No. 3 broke in two and the rear portion afterward ran into the forward one, wrecking a number of cars, which fell upon track No. 2. An eastbound freight train was passing on track No. 2 and a number of cars in the middle of that train were derailed and wrecked and thrown over upon track No. 1. On track No. 1 another eastbound freight train, running at full speed, was derailed by the wreck and the engine was overturned and fell down a bank. In all, 30 freight cars were demolished. The engineman and fireman of the train on track No. 1 were killed and a brakeman of the same train was fatally injured.

13th, on Atchison, Topeka & Santa Fe, at Moody, Tex., a freight train standing at the station was run into at the rear by a following freight; two engines and four cars wrecked; two trainmen injured.

13th, 9 p. m., on Central of New Jersey, at Triechlers, Pa., passenger train No. 18 ran into the rear of a preceding freight train. The engineman, fireman and baggageman of the passenger train and the rear brakeman of the freight train were killed and two freight brakemen were injured.

16th, 5.17 p. m., on New York, New Haven & Hartford, at Albany Street, Boston, a westbound passenger train which had been stopped because the engineman was in doubt about a block signal, was run into at the rear by a following passenger train and the rear car was wrecked. Fifteen passengers were reported as injured, but only two of them seriously. There were but few passengers in the car that was wrecked. The foremost train is usually sent forward from the signal cabin near Albany Street on track No. 3, but in this case the signal was given to proceed on track No. 1. This was so unusual that the engineman stopped to communicate with the signalman, so as to make sure that there had been no mistake. The second train ran past the block signal, set against it at the entrance to the block section in which the collision occurred. This signal was but a short distance back of the standing train. There is a curve in the line at this point and a signal on the Boston & Albany road, adjoining, was nearly in line with the one which the engineman failed to observe.

18th, on Pittsburgh & Lake Erie, at Hays, Pa., a freight train ran into the rear of a preceding freight, damaging the engine and several cars. Two trainmen were injured.

18th, on Brooklyn Elevated, at Ninth Street, Brooklyn, N. Y., a passenger train ran into the rear of a preceding passenger train, damaging two cars. Three passengers were injured. There was a dense fog at the time.

19th, on Philadelphia & Reading, near Reading, Pa., an engine ran into the rear of a preceding freight, wrecking the caboose. Three trainmen were injured.

20th, 1 a. m., on Southern Pacific, at Terrace, Utah, an empty engine ran into the rear of a passenger train, in the yard, wrecking one sleeping car. The fireman was killed and the engineman injured. The passengers in the sleeping car were all at the front end and were uninjured. There was a dense fog at the time.

20th, on Denver & Rio Grande, at Belden, Colo., a freight train descending a grade at good speed ran into an empty engine ahead of it, which had been stopped by a preceding passenger train, and pushed the engine into the rear car of the passenger train, badly damaging both engines, a sleeping car and three freight cars. One passenger and one trainman were injured.

20th, on Atchison, Topeka & Santa Fe, near Ardmore, I. T., a freight train, unexpectedly stopped, was run into at the rear by a following freight, and two engines, a caboose and 11 cars were wrecked and destroyed by fire. One engineman was injured.

21st, on Central of New Jersey, near High Bridge, N. J., a milk train with a passenger car at the rear, standing at the station, was run into at the rear by a freight train, badly damaging two passenger cars. One passenger was killed and two passengers and a baggageman were injured. The wreck took fire and it was necessary to call out the town fire department. The freight train had been stopped some distance back, on a descending grade, and the engine had been detached and run forward to the station. While it was standing there, near the passenger train, the freight cars, which had been left with the air brakes applied, came down the grade uncontrolled and ran into their own engine, pushing it forward into the cars of the milk train.

21st, on Pennsylvania road, at Fifty-second Street, Philadelphia, an eastbound passenger train which had just started from the station was run into at the rear by a following passenger train. Four passengers were injured.

21st, on Southern Pacific, at Davis, Cal., a freight train ran into the rear of a preceding freight, damaging the caboose. One passenger was injured.

23rd, on Louisville & Nashville, at Gap in Knob, Ky., a passenger train just starting from the station was run into at the rear by a freight train, and the rear passenger car was wrecked. One passenger was killed and five were injured. There was a dense fog at the time. A number of passengers were hurt by jumping out of windows.

23d, on South Side Elevated road, Chicago, rear collision of passenger trains, badly damaging one cars; one passenger injured. There was a dense fog at the time.

27th, 3 a. m., on Ft. Worth & Denver City, near Goodnight, Tex., rear collision of freight trains; engineman killed and fireman injured.

27th, on Chicago & Grand Trunk, near Durand, Mich., rear collision of freight trains; three trainmen injured.

29th, on Union Pacific, at Brighton, Colo., rear collision of passenger trains, badly damaging three cars and one engine. Two passenger cars took fire and were destroyed. The express messenger was killed and five passengers, one brakeman and six section men riding in one of the cars were injured.

29th, on Columbus, Sandusky & Hocking, near Columbus, O., a freight train ascending a grade was run into at the rear by a following freight, and the engine, caboose and several cars were wrecked. Fire broke out and a part of the wreck was burned up. One brakeman was killed and the engineman and fireman were injured.

And 31 others on 20 roads, involving 3 passengers and 44 freight and other trains.

Butting.

3d, 4 a. m., on Cincinnati, New Orleans & Texas Pacific, at Annadel, Tenn., a northbound freight train, with two engines at the head, standing on the main track taking water, was run into by a southbound double header freight train, damaging the engines considerably. One engineman was killed and one fireman was injured. The southbound freight should have entered the side track at a switch some distance short of the point of collision, but the engineman did not properly control his speed.

5th, on Chicago, Milwaukee & St. Paul, at Beloit, Wis., a passenger train ran over a misplaced switch and into the head of a freight train standing on a side track; two trainmen and three passengers injured.

6th, on Baltimore & Ohio, near Mansfield, O., butting collision between a freight train and a work train, making a bad wreck. One employee was killed and four injured, one of them fatally.

25th, on Northern Pacific, near Drummond, Mont., butting collision of freight trains, making a bad wreck. One engineman, one fireman and two tramps were killed and three other trainmen were injured. It is said that a telegraph operator (a substitute) failed to hold one of the trains.

25th, on Southern Pacific, at Chico, Cal., butting collision between a freight train and a pay car train, badly damaging both engines. The paymaster was injured. There was a dense fog at the time.

26th, on Pennsylvania road, at Columbia, Pa., butting collision of freight trains, wrecking two cars of cattle; one engineman injured.

27th, 11 p. m., on Hannibal & St. Joseph, at Ely, Mo., collision of freight trains, wrecking several cars. One engineman was killed.

28th, on Pennsylvania road, near Hunker, Pa., but-

ting collision of freight trains, wrecking both engines and 10 cars. Three trainmen were injured. It is said that the collision was due to a misunderstanding of orders.

29th, near Palmer Lake, Colo., butting collision between passenger trains of the Colorado Midland and the Atchison, Topeka & Santa Fe. One fireman was killed and two enginemen were injured.

31st, 4 a. m., on Wheeling & Lake Erie, at Lodi, O., an eastbound freight train standing at the station was run into by a westbound freight, wrecking both engines and several cars. One engineman was killed and one fireman injured.

And 11 others on 10 roads, involving 3 passenger and 19 freight and other trains.

Crossing and Miscellaneous.

5th, on Pennsylvania road, at Wilcox, Pa., collision between a freight train and an empty engine, badly damaging both engines. One trainman was injured.

5th, 8 p. m., on Boston & Albany, near Springfield, Mass., a freight train which was moving out of a side track was run into by a freight on the main track, moving in the same direction, and both engines were overturned. One engineman and one fireman were injured.

7th, on International & Great Northern, at Neches, Tex., collision between an empty engine and a freight train, wrecking three cars. A man stealing a ride was killed.

9th, 10 p. m., on Pittsburgh, Ft. Wayne & Chicago, at Lima, O., eastbound passenger train No. 8 collided with a switching freight train, badly damaging both engines and several freight cars. One fireman was injured.

10th, on Pennsylvania Lines, at Allegheny City, Pa., collision of switching freight trains, badly damaging both engines. Three trainmen were injured.

11th, on Pennsylvania road, at Pittsburgh, Pa., collision of freight trains, wrecking several cars. A brakeman was killed.

12th, on Philadelphia & Reading, near Norristown, Pa., collision of switching engines, damaging both engines and several cars. One engineman was injured.

13th, 6 a. m., on Pennsylvania road, at Camden, N. J., a passenger train ran into an engine and empty passenger car moving backward in the yard; two trainmen and one passenger were injured. There was a dense fog at the time.

16th, 6 p. m., on Pennsylvania, near Cleveland, O., a northbound passenger train of the Cleveland, Akron & Columbus ran into a switching freight which was backing into a side track, and both engines were derailed and overturned. Three men on the switching engine were killed. The engineman, fireman and conductor of the passenger train were injured.

18th, at New Albany, Ind., a passenger train of the Pennsylvania and a locomotive of the Louisville & St. Louis collided and one passenger car was overturned. Seven passengers were injured.

19th, on Cincinnati, Hamilton & Dayton, at Toledo, O., a collision between a freight train and a switching engine; one engineman injured.

22nd, on Philadelphia, Wilmington & Baltimore, near Concord, Pa., five cars broke away from a switching freight train and ran down grade eastward some distance, where they collided with a westbound passenger train; locomotive and fire freight cars wrecked; engineman and fireman killed and one brakeman injured.

22nd, at Buffalo, N. Y., collision between a passenger train of the Buffalo & Southwestern and an engine of the Delaware, Lackawanna & Western at the crossing of the two roads. The Lackawanna engineman was killed and the fireman fatally injured.

23d, on Chicago & Northwestern, near Chicago, Ill., collision of passenger trains; one passenger injured.

26th, on Pennsylvania road, near Cove, Pa., collision of freight trains; one trainman injured.

27th, 2 a. m., at Streator, Ill., a passenger train of the Chicago & Alton was run into by a switching engine of the Atchison, Topeka & Santa Fe at the crossing of the two roads, and one passenger car was overturned. The fireman of the switching engine was injured.

27th, on New York, Chicago & St. Louis, at Cleveland, O., a freight train collided with some cars on a siding, which fouled the main line, and the fireman jumped off and was killed.

28th, on Long Island road, at Bellmore, N. Y., an empty passenger train standing at the station was run into by a freight train; two trainmen injured.

29th, on Southern Railway, at North Birmingham, Ala., collision between a passenger train and a freight, wrecking two freight cars. One passenger and two trainmen were injured.

29th, on Charleston & Savannah, near Savannah, Ga., passenger train No. 35 of the Southern Railway collided with a freight train. Eight freight cars were badly damaged and the wreck was partly destroyed by fire. The passenger fireman jumped off and was injured.

29th, on New York, New Haven & Hartford, at Stonington, Conn., collision between a passenger train and some freight cars; baggageman injured.

30th, on Southern Railway, near Duncan, S. C., collision between a freight and a work train, badly damaging several cars. The superintendent of a bridge construction gang was killed and four employees were injured.

31st, on Lake Shore & Michigan Southern ,at Collingwood, O., a freight train standing in the yard was run into at the rear by a switching engine and the caboose was wrecked. A brakeman was injured.

31st, on Philadelphia & Reading, at Lebanon, Pa., a switching engine was run into by a freight train; one trainman injured. It is said that the freight train disregarded a flag which had been sent out to stop it.

And 25 others on 20 roads, involving 9 passenger and 38 freight and other trains.

DERAILMENTS.

Defects of Roadway.

9th, on Grand Rapids & Indiana, at Avilla, Ind., a freight train was derailed at a defective switch and 22 cars were ditched. A tramp was fatally injured.

18th, on Southern Pacific, near Hollister, Cal., the locomotive of a passenger train was derailed at a defective switch; a brakeman was injured.

27th, on Southern Railway, near Marion, Ala., a freight train was derailed by a broken rail and six cars were ditched. Three trainmen were injured.

And 7 others on 7 roads, involving 3 passenger and 4 freight and other tains.

Defects of Equipment.

22d, on Southern Pacific, at El Paso, Tex., a switching engine was derailed near the station and ran into the baggage room. One employe was killed and an employee and a bystander were injured. It is said that the derailment was due to a broken flange.

24th, on Southern Pacific, at Pomona, Cal., a passenger train was derailed by the breaking of one of the wheels of the engine and a passenger car was overturned. Three passengers were killed and 12 were injured.

25th, on Cleveland, Cincinnati, Chicago & St. Louis, near Waynetown, Ind., a passenger train was derailed by the ash pan of the locomotive which became loose and fell on the track. The passenger cars were ditched and the passengers were injured, but only one of them seriously.

27th, on Southern California, near Verdemont, Cal., a freight train was derailed by the breaking of one of the wheels of the engine, and nine loaded cars were wrecked. Some of them broke through a bridge and fell to the creek below. One of the cars was set afire by an explosion inside of it and the most of the wreck, including the bridge, was burned up. A tramp went down with the wreck and was injured.

29th, on Pennsylvania road, at 59th Street, Philadelphia, a passenger train was derailed by a broken truck and the engineman was injured.

And 26 others on 17 roads, involving 1 passenger and 25 freight and other trains.

Negligence in Operating.

12th, on Jacksonville & Southwestern, near Lake Butler, Fla., a work train was derailed by a misplaced switch and several cars were wrecked. The fireman was killed and four trainmen were injured.

15th, on Northern Pacific, near Kendrick, Idaho, a train consisting of two engines and 19 platform cars, loaded with steel rails, became uncontrollable on a steep grade and four cars of the train were derailed and wrecked at a curve; the forward portion of the train ran some distance farther and the whole of it was ditched at the entrance to a station yard. Two enginemen, one fireman and one brakeman were killed and another brakeman was fatally injured. It is said that the rails on the cars were covered with ice and snow, so that the trainmen had difficulty in getting from one car to another.

23d, on New York Central & Hudson River, at the Grand Central Station, New York City, a passenger train entering the station, from which the engine had been detached, was allowed to run too fast and the foremost car ran against the buffer. Two passengers were injured.

29th, on Wheeling & Lake Erie, near Dalton, O., the engine and three cars of a freight train broke through a trestle bridge and were wrecked. The fireman and one brakeman were injured, the former fatally. The bridge was being repaired and the speed of the freight train was not properly controlled, although it is said that a proper caution signal was given.

And 8 others on 8 roads, involving 2 passenger and 6 freight and other trains.

Unforseen Obstructions.

2d, on Great Northern, near Great Falls, Mont., a freight train was derailed by running over a steer, and the engine and 10 cars were wrecked; engineman, fireman and one brakeman killed.

8th, on New Orleans & Northeastern, near Ellisville, Miss., a freight train was derailed by running over an ox and seven cars fell down a bank. The engineman was injured.

12th, 2 a. m., on Norfolk & Western, near Alnwick, W. Va., passenger train No. 3 was derailed by a rock which had fallen upon the track and the engine and the mail car fell down a bank. This car took fire and was destroyed. The engineman was killed and the fireman was slightly injured.

14th, on Pennsylvania & Northwestern, at Coalport, Pa., a freight train was derailed by running over a cow and two engines fell down a bank. Both enginemen were injured.

And 3 others on 2 roads, involving 3 freight trains.

Unexplained.

1st, on Boston & Maine, at Ossipee, N. H., the rear car of a passenger train was derailed at a switch and overturned. Two passengers were injured.

2d, on Kinderhook & Hudson, at Kinderhook, N. Y., a work train was derailed and an employee was killed.

5th, on Southern Pacific, near Coalinga, Cal., a freight train was derailed and the fireman was injured.

9th, on Wabash road, at Worth, Ill., the caboose of a freight train was derailed and overturned and two trainmen were injured. A following freight train ran into this train, derailing engine and several cars. The fireman and two brakemen were injured, one of them fatally.

12th, on Brooklyn Elevated, at 34th Street, Brooklyn, N. Y., the locomotive of a passenger train was derailed and partially overturned.

14th, on Boston & Maine, near East Somerville, Mass., several cars in a freight train were derailed and two of them fell down a bank. A brakeman was injured.

18th, on Cleveland, Cincinnati, Chicago & St. Louis, at Linndale, O., the engine of a freight train was derailed at a switch. The engineman jumped off and was injured.

24th, on Portland & Rochester, at Portland, Me., a car in a freight train was derailed. The conductor was killed and a brakeman was injured.

And 37 others on 29 roads, involving 2 passengers and 35 freight and other trains.

OTHER ACCIDENTS.

12th, on Philadelphia & Reading, near Rickenbach's, Pa., the locomotive of a passenger train was damaked by the bursting of a water bar in the firebox. The fireman was injured.

20th, on Boston & Albany, at South Athol, Mass., the locomotive of a passenger train was wrecked by the explosion of its boiler and the engineman and fireman were injured. Considerable damage was done in the passenger car next to the engine.

22nd, on Baltimor & Ohio, near Engle, W. Va., a baggage car of passenger train No. 1 was set afire by a lamp dropped by the baggageman, and was destroyed. By energetic work the car was derailed and pushed down a bank, so that the wreck did not block the track.

29th, on Brooklyn Elevated, at Manhattan Crossing, Brooklyn, N. Y., the locomotive of a passenger train was damaged by the rupture of the crown sheet, and the engineman and fireman were scalded.

A summary will be found in another column.

TECHNICAL.

Manufacturing and Business.

The Hancock Inspirator Co. has moved its general offices and salesrooms from Boston to those of Manning, Maxwell & Moore at 85-89 Liberty St., New York City.

We have an inquiry for 20 second-hand standard gage flat cars of 60,000 lbs. capacity, equipped with neither air brake nor automatic couplers. We shall be glad to forward any communications.

Iron and Steel.

B. F. Haldeman, Superintendent of the Bessemer Department, and Frederick M. Stammler, Superintendent of the coke plant of the Cambria Steel Co., have resigned. W. C. Catlin succeeds Mr. Haldeman, and Dr. Martin Rothberg, at present Chief Chemist, succeeds Mr. Stammler.

The re-advertisement for bids for steel work for the Superior St. viaduct in Cleveland, O., brought a reduction in the price of steel of $25 per ton. Seven or eight firms bid for the work at the first advertisement, the lowest bid then was $85 per ton. The re-advertisement brought it at $60.

The Pennsylvania Steel Co. has booked among other orders the following: For bridges requiring 5,000 tons of steel along the Western Division of the New York Central & Hudson River RR.—this is probably for the 23 bridges noted in another column —and for 25 bridges along the West Virginia Short Line, needing 2,500 tons of steel.

The Crown Steel Co. has been incorporated in West Virginia, with a capital of $2,500, with the privilege of increasing it to $2,000,000. It is to do a general steel and iron business. Henry B. Chapman, Wm. L. Ruston, Eugene B. Fitler and Harrison B. Balcom are among the incorporators.

The plan of consolidating the Susquehanna and the New Haven Iron & Steel companies into the Atlantic Iron & Steel Co. is to be abandoned. It was so decided at a meeting of the promoters on Jan. 30.

The McKees Rocks, Pa., plant of the Pressed Steel Car Co. was placed in operation Jan. 29.

The American Iron & Steel Mfg. Co., Lebanon, Pa., at the January meeting, declared dividends on the preferred and common stock amounting to $200,000. This represents the earnings for four months to Jan. 1, 1900. Edward N. Moore, formerly of Youngstown, O., has been appointed General Superintendent of the rolling mills.

A British Record in Bridge Building.

The activity of the Boers has given the Englishmen a chance to do some quick bridge building. The bridges over the Tugela at Colenso and at Frere were destroyed by the Boers and the Natal Government immediately ordered new ones, stronger and heavier than the wrecked bridges. Drawings had already been made and bids were invited in Great Britain and in the United States. The order went to the Patent Shaft & Axletree Company, of Wednesbury. This firm undertook to deliver the first shipment of one span in six weeks from the date of the order. The order was given Dec. 21 and the first span was completed Jan. 13. Deducting three Sundays and two holidays, the work was done in 19 working days. This included erecting the span complete in the yards of the company. There are to be in all seven spans of 105 ft. each, five for Colenso and two for Frere. Each span will weigh about 105 long tons, exclusive of rivets, and there are 69,000 rivet holes to be drilled in each span. The material is Siemens-Martin steel throughout. These bridges are 16 ft. wide, to accommodate one track 3 ft. 6 in. gage, with wagonways on either side. The order was received 9 a. m. Dec. 21 and by 5 p. m. of the same day about 100 tons of the material had been rolled, tested and approved by the Natal Government engineer, and some of the plates were on the planing machines. About 100 men and boys have been at work continuously on the order, but there has been no night work. No material further advanced than the stage of ingots was in stock when the order was received.

THE SCRAP HEAP.

Notes.

The Legislature of Virginia has passed a bill requiring the railroads in that State to run separate passenger cars for negroes.

A press dispatch from St. Louis says that the Pennsylvania has subscribed $50,000 toward the fund for the St. Louis World's Fair, to be held in 1903 to commemorate the Louisiana purchase centennial.

The Baltimore & Ohio has borrowed 20 locomotives from the Great Northern and four from the Minne-

apolis, St. Paul & Sault Ste. Marie, for use in clearing up the rush of freight on the Chicago end of the road.

The Simplon Tunnel.

On November 13, 1898, work was begun on the Simplon Tunnel. The contract calls for its completion in five and one-half years. During November, in which ten days were lost on account of a strike, there was drilled at the south end 472 ft. and at the north end 404 ft. The total, since the commencement of the work, is 3,574 meters, 2,148 meters at the north end and 1,426 meters at the south end.

Steam and Air for Cars in Boston South Station.

At all the stub track ends in the train shed and throughout the express yard, 47 places in all, provision has been made for steam heat to the cars. The steam pipe at the ends of the tracks in the train shed is on the loop system, and any break in the main pipe does not interrupt the supply to any great extent. Perhaps the only interesting feature in this provision is the metallic universal joint connection to the car hose, the McLaughlin joint, of very simple pattern, hardly to be described without detail drawings.

Two Westinghouse air brake pumps are installed in the power house to supply air for testing brakes and charging the cars, and this air is delivered at the 47 stub tracks in the train shed and express yards. A main and several auxiliary reservoir tanks are used to provide storage, and provision is made for draining off the condensation water. At the track ends in the train shed the air passes through rubber hose to the car connection. Out of doors the air passes through the McLaughlin metallic universal joints. This system of compressed air piping and machinery is kept separate from the compressor plant for switches and signals.

Lubrication.

At the January meeting of the New York Railroad Club lubrication was the special topic. The Secretary of the Club, Mr. W. W. Wheatly, 168 Montague St., Brooklyn, was instructed to notify railroad companies that the report of the discussion in full will be furnished in case the railroad companies desire it for distribution among their employees. Requests for such additional copies must be sent to the Secretary on or before Feb. 5. They can be furnished in quantities at about 12 cents a copy.

Another Boston Subway.

A bill has been introduced in the Massachusetts Legislature providing for building a subway under Washington Street, and the friends of the enterprise think that probably there will be more subways in Boston within a few years. The one which is now in operation is a very fine piece of engineering work, viewed either from the standpoint of construction or of convenient movement of traffic.

The Arnold Magnetic Clutch.

Last week we described the Arnold magnetic clutch. Mr. George A. Damon, who is connected with the Arnold Electric Power Station Co., the makers of this device, has sent us some additional particulars. He states that the clutches are carefully surfaced to a fit in order to avoid an air gap, which is fatal to the strength of the magnetic circuit. The friction between the two surfaces does not depend upon the roughness of the faces; in fact, the smoother the surfaces the better is the adhesion between them and consequently the greater the transmitting power of the clutch. From this we may judge that the attraction between the two surfaces is almost entirely depended upon to give the necessary transmitting power of the clutch. In regard to the expense, we are told that the magnetic clutches cost, in small sizes, about twice as much as the ordinary friction clutch.

Price of Coupler Gages.

In accordance with the instructions of the Master Car Builders' Association, the question of the cost of the gage for worn M. C. B. couplers (which gage was adopted as recommended practice at the last convention), has been canvassed, in connection with the Committee on M. C. B. Couplers, with the result that the Pratt & Whitney Co., of Hartford, Conn., quote a price of $20 each, based on orders for at least three hundred gages. The replies received to the circular of October 19, 1899, indicate that at least two hundred and fifty will be ordered to start with, and that orders for additional gages will follow in some cases, should the first gage prove satisfactory. In order that the work of fitting up tools, etc., preparatory to the manufacture of these gages, may begin at once, it is suggested that orders be placed with the Pratt & Whitney Co. as promptly as possible.

Ajax Bearing Metal.

A series of laboratory experiments has been made by the Ajax Metal Co. to meet the basis facts learned by tests on the Pennsylvania Railroad, which are, briefly, that the loss by wear of bearing metals diminishes with the increase of the amount of lead and the decrease in the amount of tin in the composition, and that the practicable limit to the increase of lead and decrease of tin is found in the segregation, or lack of homogeneity, of the alloy. The Ajax company now announce that they have succeeded in reducing, in their metal, the amount of tin from 8 per cent. to 5 per cent., and increasing the amount of lead from 15 per cent. to 30 per cent., producing a homogeneous metal whose friction tests, as compared with phosphor-bronze, show 20 per cent. less rise in temperature and less than one-third of the relative wear. The Ajax metal is on the Pullman cars, and so reaches practically all railroads in the United States and its behavior can be watched by all.

Since the establishment of pensions on the Pennsylvania a movement has been started among the employees of the Chicago, Burlington & Quincy looking to the introduction of pensions on that road. One account says that an application will be presented to the officers of the company, while, according to another, the employees purpose to establish a fund on their own account. The number of employees is said to be 36,000, and it is proposed to assess employees one per cent. of their salaries.

An order has been issued by the Delaware, Lackawanna & Western to the effect that when an engine has to set back for a portion of its train which has been left it must, if it is to go through a tunnel, be run on the westbound track if backing west and the eastbound track if backing east; though if there are no crossovers within reasonable distance the engine may move in the wrong direction on its own track, but in that case a brakeman must precede it with hand signals. Not long ago a number of trackmen were killed in a double-track tunnel by an engine moving on the left hand track, the men having expected it on the right-hand track.

Traffic Notes.

At Washington on Jan. 26 the Senate Committee on Commerce listened to arguments from representatives of the National Board of Trade in favor of the passage of the Cullom bill to amend the Interstate Commerce Law.

Chicago reporters profess to have learned last week of considerable secret cutting of rates on grain to the Atlantic seaboard. One report says that 2,000,000 bushels of corn was contracted to Philadelphia and Baltimore at reduced rates. One grain shipper mentions a rate as low as 14 cents to New York.

Increased freight rates, brought about by changes in classification, went into effect on the lines west of Chicago Jan. 25 on about 200 commodities. A press dispatch says that the average increase is about 10 per cent.

It is announced at St. Louis that on May 1 the Burlington road will begin to run passenger trains through between that city and the Pacific Coast by way of Billings, Mont.

The Railroad Commissioners of Massachusetts, acting on an order from the Legislature, has made a report on the question of bicycle transportation, and declines to recommend any legislation looking to free carriage. The rates charged by the Massachusetts railroads for wheels in baggage cars are very low. Another part of the report deals with suburban passenger fares around Boston. Very low rates are charged within a radius of about 12 miles, and there was some demand for the extension of the low-rate district; but the Commission finds that this demand is not a pressing one, and evidently believes it to be unreasonable.

The conference between the lines east of Chicago and those west, concerning through billing, which was held in New York last week, led to no definite result. It appears that the Eastern roads are still determined to stop billing through by way of Chicago and by Central Illinois junctions at less than the total of the rates east and west of the gateway; but the adoption of this change will be sure to turn some traffic through St. Louis which hitherto has been sent by lines farther north. The object of the Eastern lines is, of course, to secure a larger share of the through rate.

The Comptroller of the Treasury Department at Washington has rendered a decision which, in effect, appears to hold that the Government should not pay bills for transportation of soldiers by railroad unless the Government is allowed a discount increasing with the size of the party, as is allowed to theatrical and other companies by many railroads on party rate tickets. It appears that where the Government is entitled to a discount, as, for example, on a land grant railroad, the Comptroller holds that the discount should be a percentage, not of the regular single fare, but a percentage of the reduced rate which would be granted to a like number of persons on a party-rate ticket. The Comptroller says that the railroads attempt to limit the use of party rate tickets to a few small classes instead of making them open to the whole public on the same terms. From the newspaper accounts it appears that the difficulty referred to by the Comptroller arose in the Southern States.

Railroad Supplies for France.

Mr. George H. Jackson, Consul at La Rochelle, France, reports that after a conference with the chief director of the State Railroads he has been assured that bids for railroad supplies coming from American sources will receive serious consideration. He quotes the following conditions: "No one is permitted to compete for award of contracts who is not capable of giving a guaranty for the faithful execution of contracts. To this end, each bidder is required to present a certificate, stating his ability, and to deposit a regularly negotiated bond, except as provided for in last paragraph of Article IV., and other exceptions allowed by laws, decrees, and rules now in force. Foreign bidders can be admitted to competition. Bidders whose establishments are outside of France (French territory) and foreign bidders will be admitted only when a bond supplied by a French bank has been accepted by the director." This administration operates 1,758 miles of road.

Disastrous Train Wreck and Explosion at Ashley, Pa.

On the evening of January 25, at Ashley, Pa., near Wilkesbarre, a freight train, which had become uncontrollable on a descending grade, collided with two locomotives, making a serious wreck; and the wrecked cars were at once spread for many hundred feet around by an explosion of dynamite, of which there were 30 boxes in one of the cars. Seven locomotives standing near by were wrecked, the roof of a round-house was knocked down and a large tank of water was broken open, nearly drowning a number of persons. Five persons were killed by the explosion of the wreck and seven were seriously injured. Many cars were destroyed and windows were broken in numerous houses within a radius of half a mile.

Association of Superintendents of Bridges and Buildings.

The committee reports for 1899 and 1900 of this Association are to be on Tools for Bridge Men, Snow Fence, Track Scales, Concrete for Piers, Abutments, etc., Hand and Power Riveting and Drilling, Bumpers for Yard Terminals and Tie Plates on Bridges.

New York Central Bridges for 1900.

The New York Central & Hudson River RR. Co. during the past year let a large number of contracts for new bridges to be built between New York and Buffalo, as follows:

	No. of Bridges.
King Bridge Co.	1
Elmira Bridge Co.	15
Pennsylvania Steel Co.	23
A. & P. Roberts Co.	31
Phoenix Bridge Co.	2
Buffalo Bridge & Iron Works	8
Union Bridge Co.	10
Hilton Bridge Con. Co.	24
N. J. Steel & Iron Co.	12
Detroit Bridge & Iron Works	15
Total	141

These bridges consist of solid floors, plate girders and riveted lattice types, with lengths of spans varying from 15 to 182 ft. They will aggregate in weight about 32,000 tons; and in length (base on single-track measurement) about 40,000 lineal feet.

A New Iron Works & Dry Dock Co.

The Morse Iron Works & Dry Dock Co., of Brooklyn, N. Y., was incorporated January 27, with a capital of $550,000, to build ships, wharves and warehouses. Among the incorporators are Edward P. Morse, Charles G. Street and Wm. L. Chapman, of Brooklyn.

New Directors for the Brooklyn Rapid Transit.

At the annual meeting of the Brooklyn Rapid Transit Co., held on Jan. 26, six new directors were elected. They are F. P. Olcott, A. R. Flower, E. H. Harriman, August Belmont, H. H. Porter, Walter G. Oakman, all of Brooklyn.

Public Works in New York.

At a meeting of the New York Aldermen Jan. 30, resolutions providing for the following bond issues were introduced: $644,495 for the Vernon Avenue bridge; $20,000 for Riverside Park; $100,000 for a covered dump for the Street Cleaning Department at the foot of Stanton Street; $250,000 for Change of Grade Commission damages; $2,880,765 for the street and highway assessment fund; $207,520 for the replenishment of the street and park opening fund; $365,250 for Little Italy Park; $500,000 for the new East River Bridge, and $167,000 for new sewers; total, $5,135,030. All the resolutions were referred to committees.

Technical Schools.

University of Illinois.—The attendance this school year at the University is 2,250, which is 426 more than the enrollment last year. Occasionally, notes have been given regarding some of the changes in the departments of mechanical and electrical engineering. We have just received an announcement of the courses in the latter department and note particularly that Prof. Aldrich has outlined what appears to be very practical courses in power transmission plants and electric railroad construction. Under courses 7 to 11 are the following: Electrical distribution, which includes discussion of methods of testing distributing circuits. Under electric power transmission is a study of long distance transmisson plants and of the construction, maintenance and protection of lines with a comparison with other systems. Electric Lighting, Electric Traction and Power Plants are topics taken up with equal care, each covering nine weeks. Prof. Aldrich teaches these subjects.

H. G. Prout, editor of the Railroad Gazette, will give a lecture at the University on Feb. 14, on "Engineers and the Railroads."

Prof. N. C. Ricker, Prof. of Architecture and Dean of the Engineering College, has been unanimously re-elected as President of the Board of Examining Architects of Illinois.

Purdue University.—On Tuesday afternoon, January 30, Mr. Martin A. Knapp, Chairman of the Interstate Commerce Commission, lectured at Purdue University on "The Interstate Commerce Laws and Their Relation to the Public."

University of Michigan.—Mr. Carroll D. Jones, of the Department of Electrical Engineering, has calculated the cost of light and power at the University. He finds that at present the total amount of work done by the machinery which furnish electric power at the University is 179,700 kw. hours, and this gives 3.112 cents as the cost of electricity per kw. hour. When the plant was installed, the University was paying the Ann Arbor Electric Light & Power Company 13.39 cents per kw. hour. If the University had to pay for the electricity it is now using at the old price of 13.39 cents, the cost of power for lighting would be $18,470 more than it is now. A 16 c. p. incandescent lamp per hour now costs to run .186 cent and for the arc lights the amount is 1.43 cents. Additional machinery may be put in, giving a total output of the plant of 425,000 kw. hours, in which case the cost per kw. hour would be reduced to about 2.48 cents.

The senior classes in electrical and mechanical engineering will make a test of the Birmingham power station of the Detroit & Pontiac Electric Railroad.

A 5-kw. alternating current dynamo is being built by the students in the department of electrical engineering, and it has been so designed that one, two or three phase currents can be generated. It will, of course, in this respect, be capable of doing the work of three different types of dynamos. This machine will be used in the laboratory.

Stevens Institute of Technology.—Among the tests recently conducted by the professors of the Institute is one on a new triple-expansion pump recently installed in the pumping station of the Hackensack Water Company at New Milford, N. J. In this test the pump showed the remarkable duty of 168,000,000

foot-pounds per 1,000 lbs. of feed water. These figures do not include any allowance for boiler leakage or moisture in the steam at the throttle valve. Other investigations, now being made, include tests of a new style of storage battery for automobile work, and a test on an engine using highly superheated carbonic acid gas at 1,300 lbs. pressure.

A test of Mr. J. Pierpont Morgan's new steam yacht Corsair was recently made by Professor Denton, assisted by a party of 12 seniors. The trial was over a 3½-knot course on Long Island Sound. The yacht attained a speed of 19.1 knots an hour, exceeding the builder's contract by over one knot.

A large return steam trap of a well-known make has been presented to the Institute. This trap is in sections, and will be used in the lecture room and as a subject in sketching and drawing. Another firm of high standing has given two compound injectors, one for practical work and the other (which is in sections) for use in lectures, and for instruction in drawing. A recording voltmeter has also been presented to the Institute through one of the professors.

The requirements for the degree of M. E. at Stevens have been made to include a course in Bookkeeping and Accounting. Mr. T. Cullen Roberts, who is a Fellow, and also the Secretary of the American Association of Public Accountants, has been secured to conduct the course, which will come in the junior year. A standard of proficiency at the end of the course will be required.

The contract for the building of the new Carnegie Laboratory of Engineering has been awarded to Messrs. Ackerman & Ross, of New York. This firm has prepared the detail plans, and work will be begun this spring. Mr. Ackerman is a graduate of Stevens (Class of '91). His firm has also secured three contracts for library buildings, to be erected through the liberality of Mr. Andrew Carnegie. The libraries referred to will be erected in Washington, D. C., St. Louis, Mo., and Atlanta, Ga.

University of California.—As it will be several years before the new buildings (for which the necessary money has been given) can be ready for use, the regents have decided to make at once several additions to the old buildings. A home for the President will be built at a cost of $25,000 on the University grounds, additions will be made to the chemical building and to the gymnasium, and Mrs. Hearst will give a separate gymnasium for women, which will be built next summer.

LOCOMOTIVE BUILDING.

The Kingston & Pembroke will order one 75-ton engine.

The Elgin, Joliet & Eastern is reported in the market for five locomotives.

The Union Pacific is reported as considering buying a number of new locomotives.

The Intercolonial is building at its Moncton, N. B., shops, four mogul freight engines.

The Chicago Great Western is reported as preparing specifications for 30 locomotives.

The Black Hills & Fort Pierre is having one engine built by the Baldwin Locomotive Works.

The Hidalgo & Northeastern has ordered four locomotives from the Baldwin Locomotive Works.

The Wisconsin Central is reported to have ordered five more engines from the Brooks Locomotive Works.

The Iowa Central has bought four locomotives, built for another road, from the Cooke Locomotive & Machine Co.

The Bangor & Portland has ordered the one locomotive referred to last week from the Cooke Locomotive & Machine Co.

The Duluth & Iron Range has ordered two more engines from the Schenectady Locomotive Works for April and May delivery.

The Pittsburgh & Western has ordered the six engines referred to last week from the Pittsburgh Locomotive & Car Works.

The Burlington, Cedar Rapids & Northern has not recently ordered locomotives, as reported by a contemporary last week. No locomotives have been bought since early in 1899.

The Colorado & Southern has ordered three 10-wheel passenger engines with 20 in. x 26 in. cylinders and five consolidation engines with 21 in. x 28 in. cylinders, from the Rhode Island Locomotive Works.

The Fort Worth & Denver City has ordered five 10-wheel passenger engines from the Rhode Island Locomotive Works. They will be duplicates of the three locomotives of the same type ordered by the Colorado & Southern.

The Erie has asked three builders to bid on 25 simple consolidation engines. These were referred to under New York, Susquehanna & Western, Dec. 29. The specifications call for 22 in. x 28 in. cylinders; 64 in. driving wheels; boilers 70 in. in diam. with Wootten fireboxes and 358 charcoal iron tubes 2 in. in diam. and 15 ft. long; working steam pressure 200 lbs.; and fireboxes of Carbon steel, 114 in. long and 96 in. wide. The engines will weigh 190,000 lbs. with 170,000 lbs. on the driving wheels, and have a tender capacity for 6,000 gals. of water and 14 tons of coal. The special equipment will include Westinghouse brakes, Gollmar bell ringers, Kewanee brake beams on tenders, M. C. B. brake shoes and couplers, 23 in. square case headlights, two Metropolitan No. 10 injectors, U. S. Metallic piston and valve rod packings, three 3-in. Consolidated muffled safety valves, Leach triple pneumatic sanding devices, Detroit triple sight-feed lubricators, French springs, Ashcroft steam gages, 30-in. Paige spoked-center truck wheels, New York Car Wheel Works tender wheels, to weigh 750 lbs. and measure 36 in. in diam., Magnus metal journal bearings and American balanced steam chest valves.

CAR BUILDING.

The Kingston & Pembroke will order 20 flat cars of 60,000 lbs. capacity.

The Canadian Pacific has ordered material for 200 box cars to be built at its Perth shops.

The Central Vermont is building at its St. Albans shops a few cinder and a small number of flat cars.

The Grand Trunk is ordering material for 300 box and 700 cars of other classes, to be built at its Montreal shops.

The South Side Elevated (Chicago) asked bids Jan. 31 on 30 cars to be ordered at once. The order may be increased to 50.

The Paris, Lyons & Mediterranean order with the Pressed Steel Car Co., referred to Jan. 12, calls for 100 cars of 100,000 lbs. capacity.

The Philadelphia & Reading has ordered 500 wooden box cars of 60,000 lbs. capacity, with steel underframes, from the Pressed Steel Car Co.

The Chicago Great Western is reported as negotiating a car trust and if successful will order box, stock and coal cars, 1,000 in all, within 90 days.

The Oregon Short Line has dropped, at least for the present, the matter of building new freight cars at its own shops, recently under consideration.

The Hocking Valley has ordered 1,000 box cars from the Pullman Co. and 1,000 gondola coal cars of 80,000 lbs. capacity, from the American Car & Foundry Co.

The Virginia & Southwestern is reported to have ordered some freight cars from the Lenoir Car Co. The road has been in the market for 300 coal and coke cars.

The Mexican Southern has ordered from England one first-class, one second-class and two-third-class passenger cars and one combination baggage express and mail car.

The Wabash has asked approximate bids on from 2,000 to 3,000 box and 1,000 to 1,500 coal cars and will ask the directors to authorize buying about 4,500 cars in all. Nothing definite has been decided.

The Chicago, Lake Shore & Eastern order for 150 steel cars has been given to the Pressed Steel Car Co., as predicted in our issue of Jan. 19. They will be self-clearing, with a capacity of 100,000 lbs.

The St. Louis Southwestern is said to have bought 288 box cars from parties at Madison, Ill. It will be remembered that this road got bids some time ago in conjunction with the Chicago & Eastern Illinois on 500 box cars.

The Pocahontas, Coal River & Kanawha is reported in the market for 100 coal cars. The road is now building. General C. C. Watts, Charleston, W. Va., is President. The Equitable Construction Co., of Chicago, has the contract.

The Great Northern has ordered 50 more steel ore cars of 100,000 lbs. capacity from the Pressed Steel Car Co. They will be similar in design to those built for the road last year. The road is reported as having ordered 200 ore cars from the Haskell & Barker Car Co. and is getting prices on material for 100 steel cars of 100,000 lbs. capacity which it is said will be built at its own shops.

The New York, Ontario & Western order with the American Car & Foundry Co. for one reclining chair and five drawing-room cars, referred to last week, calls for cars to measure 64 ft. long and 10 ft. wide, for May 15 delivery. They will be equipped with Westinghouse brakes, Gould couplers, Burrowes curtain fixtures with Pantasote material, Gould draft rigging, Gold steam heating system and Gould platforms and vestibules. No special makes of axles, bolsters, brake shoes, brasses or journal boxes and journal box lids are specified.

The Illinois Central specifications for the 500 coal cars of 80,000 lbs. capacity ordered from the American Car & Foundry Co., as stated Jan. 19, call for April delivery. The cars will weigh 31,000 lbs. and measure 36 ft. long, 9 ft. 4 in. wide over sills and 8 ft. 6 in. wide inside, and 7 ft. 10¾ in. high. Westinghouse brakes, Monarch brake beams, Universal bearings, I. C. standard bolsters, cast iron brake shoes, malleable iron journal boxes, American Car & Foundry wheels, Fox trucks on 300 and Shickle, Harrison & Howard trucks on 200 will be used.

BRIDGE BUILDING.

AVONDALE, O.—A contract was let on Feb. 1 by the Wheeling & Lake Erie for a 125-ft. steel bridge over the canal at this place.

BOSTON, MASS.—The Board of Army Engineers appointed to consider the proposed Cove St. bridge has reported against building it.

CHICAGO, ILL.—Plans have been agreed upon by the city and the Pennsylvania RR. for a masonry viaduct to be built by that road over its right of way at Randolph St. The substructure will be of masonry columns supporting the one 80-ft.-long span of the viaduct. The superstructure will be of steel bridge beams entirely covered with concrete arranged in arch form. The traffic roadway will be 48 ft. wide with sidewalks 8 ft. wide on both sides. Including railings, dividing masonry, etc., the structure will be about 80 ft. wide. The floor will also be of masonry. The sidewalks will be paved with cement and the roadway with creosoted blocks, which are giving entire satisfaction as a paving on the Rush St. bridge. The expectation is that covering the steel with concrete will save it from the bad effects of the smoke and gas from locomotives and make it last much longer than uncovered steel.

The Chicago City Council on Jan. 22 at the suggestion of Mayor Harrison, passed an ordinance providing for an issue of $100,000 of bonds for a bridge over the North Branch Canal at Division St. This ordinance is to be the basis of a suit to determine whether, under the recent decision of the Supreme Court of Illinois, the city has a right to issue bonds in excess of the $17,000,000 now outstanding. If the ordinance is held to be good the city under this decision may increase its bonded indebtedness from $17,000,000 to $75,000,000, which would enable it to build the necessary bridges, extend its electric lighting system and develop the Drainage Canal water power. It is hoped that a ruling by the court can be obtained at the February term.

The Chicago, Rock Island & Pacific, reports state, proposes to spend about $500,000 in improvements this year which will include many iron and steel bridges to replace lighter structures.

Commissioner McGann has notified the Council that the Kedzie Ave. bridge over the Illinois & Michigan Canal has been closed, and he asks that new bridges be built across the canal or that it be filled in within the city limits.

CLEVELAND, O.—The Wheeling & Lake Erie has let a contract for a steel bridge at the Panhandle crossing over the Tuscarawas River. It will be of three spans 154 ft. each.

Plans are beinb made preparatory for advertising for bids for building the steel superstructure of the Willson Ave. bridge.

CLINTON, IA.—The Indiana, Illinois & Iowa Ry., according to report, proposes to build a bridge across the Mississippi River in 1900.

DASSEL, MINN.—The Meeker County Board of Commissioners, according to report, will receive bids until March 17 for a steel bridge across the Collinwood Lake Creek.

DENVER, COLO.—Regarding the report of a viaduct on West Colfax Ave. in Denver, we are informed that it is proposed from Curtis St. to the Boulevard over the railroad tracks and the South Platte River. This has long been desired by people living on the West Side and has received some consideration, but as yet no definite action has been taken. (Jan. 19, p. 45.)

Reports state that the Atchison, Topeka & Santa Fe will renew during 1900 all the small wooden bridges with stone culverts on its lines in Colorado.

FAYETTEVILLE, TENN.—The Lincoln County Court has appointed a committee to consider a bridge across Elk River near the mouth of Mulberry Creek.

GRAND RAPIDS, MICH.—Reports state that bids are wanted on Feb. 23 for the Bridge St. bridge.

HOUSTON, TEX.—The Southern Pacific system has completed between Houston and San Antonio, Tex., the following bridges of steel: Across the Guadalupe River, one span 255 ft. in length, one span 154 ft. in length and two spans of 125 ft. each; across Cibolo Creek, two spans 134 ft. each and one span of 85 ft.; across Salado Creek, two spans of 125 ft. each and one span 85 ft.

There is yet to be built between Houston and San Antonio a span of 90 ft. across Dietz Creek; a span of 154 ft. across Geronimo Creek; a span of 85 ft. across Forster Creek, and two spans, one of 155 ft. and one of 122 ft., across the Colorado River. The following work between San Antonio and Del Rio is to be completed at once: Two girders 80 ft. in length over the San Felipe, one 80-ft. span over Francisco Creek, one span 80 ft. over Chicon Creek, one span 160 ft. over Pinto Creek, one span 120 ft. over Lindsay Creek. In addition to this the company is strengthening 54 spans between Del Rio and El Paso.

LOCKPORT, N. Y.—A bill has been introduced in the Legislature to authorize a bridge built over the Erie Canal at Pine and Lock Sts. in Lockport. The Pine St. structure will cost about $50,000. An appropriation of $9,000 in addition to the $16,000 appropriated last winter is still needed for the proposed bridge across the Erie Canal at Exchange St.

LOS ANGELES, CAL.—The City Engineer informs us that the matter of a crossing over the Arroyo de Los Posos on Macy St. is in abeyance. It will probably consist merely of trestle bents.

MORRISTOWN, N. J.—Plans have been completed by the Lackawanna RR. to eliminate the grade crossings at Morris and Elm Sts., near the Morristown station. A bridge 175 ft. long will be needed.

NAVARRE, O.—A contract for a 100-ft. steel bridge over the canal at this place was let on Thursday of this week by the Wheeling & Lake Erie.

NEW HAMBURG, ONT.—The County Council of Waterloo County proposes to issue debentures to rebuild bridges. The Engineer will be directed to report on the cost.

NEW MARTINSVILLE, W. VA.—The West Virginia Short Line RR. has under contract 52 steel bridges, varying in length from about 30 to 740 ft. The total tonnage of steel work will be about 2,800 net tons.

NEW ROCHELLE, N. Y.—See Other Structures.

NEW YORK.—Bids were opened at 12 o'clock on Wednesday of this week for soundings and borings on the sites of the towers of the proposed bridge No. 3 over the East River between New York and Brooklyn. At the same time bids were also opened for bridge No. 4 between New York and Long Island City. Mr. Bernard Rolf was the lowest bidder for bridge No. 3 and Munn & Copeland for bridge No. 4. The bids for bridge No. 3 were for soundings and borings through 520 ft. of soft material, 87 ft. of rock and 230 ft. of water; for bridge No. 4 it was through 169 ft. of rock, 170 ft. of soft material and 100 ft. of water. The following is a list of the bidders and the total amount of each bid:

	R. G. Packard.	B. W. Mitchell,	Mumm & Copeland.	B. Rolf.
Bridge No. 3....	$12,513.15	$19,861	$7,966	$7,590
Bridge No. 4....	6,548.10	10,766	4,809.50	6,910

NORWAY, MICH.—The Supervisors of Dickinson County at their last meeting authorized the Committee on Buildings and Drains to have estimates made for a bridge across the Menominee River, south of the City of Norway and to report March 8. The Chairman of the Committee is Alex Le Blanc, Norway, Mich.

NORWOOD, O.—A special election will soon be held to decide on the issue of $151,000 of bonds for improvements in the village. Part of the money will be used for bridges over the Baltimore & Ohio Southwestern at the northern terminus of Second Ave.; also for a bridge on Beech St.

OTTAWA, ONT.—Reports state that a contract will soon be let for the proposed new Maria St. bridge.

PITTSBURGH, PA.—Of the $7,000,000 of bonds recently sold by the city, $520,000 will be used for building new bridges and for renewals and for repairs of others.

A new viaduct will be built over the Baltimore & Ohio and the Pittsburgh & Lake Erie railroads, in connection with a bridge over the Youghiogheny River from Versailles for the Youghiogheny Street Ry. Co.

PHILADELPHIA, PA.—A delegation from the City Council has been examining the grade crossings of the Philadelphia & Reading at Chew and High Sts., and Washington Lane, Germantown. A bill is now before the committee appropriating $70,000 to abolish these grade crossings.

PORTLAND, ME.—The survey for the proposed Vaughan's bridge are made and a report to the City Government will soon be considered. The city is to pay about $250,000 of the cost.

RATHDRUM, IDA.—Sealed proposals will be received by the Kootenai County Commissioners, at Rathdrum, up to noon, Feb. 23, for improvements to highway bridge across Spokane River near Fort Sherman, Kootenai County, which include the replacing of the west span of present bridge with a 100-ft. span, finishing center pier of present bridge and building new pier for west support of new span. Also, for the construction of a sheer boom extending from west pier to a point on west bank of river opposite pumping station, a distance of 1,160 ft. Jno. C. Callahan, Clerk of Board of County Commissioners.

RIVERSIDE, CAL.—The County Surveyor has been instructed to estimate the cost of a bridge recently petitioned for.

ROCHESTER, N. Y.—Bills for new canal crossings at West Main and Alexandria Sts. have been introduced in the Legislature. A lift bridge has been petitioned for over the Erie Canal at Plymouth Ave.

SAGINAW, MICH.—Reports state that bids will soon be asked for the Court St. bridge.

SCHENECTADY, N. Y.—The Superintendent of Public Works is directed to remove the bridge over the Erie Canal in Washington Ave., in Schenectady, and to build in its place a hoist or lift bridge. It shall have a roadway 30 ft. in width, with foot passages on each side eight feet wide. The appropriation is $20,000.

SHERMAN, TEX.—Surveys are being made for a site for the proposed railroad bridge over the Red River on the line between Frisco and Sapulpa, Tex.

SPRINGFIELD, MASS.—The County Commissioners at a meeting on Jan. 22 decreed that a new bridge be built in St. James Ave., over the Boston & Albany, the New York, New Haven & Hartford and the New York & New England Railroad tracks. This bridge is to be built according to the specifications which have been prepared for some time and referred to in this column.

SYRACUSE, N. Y.—The City Council has ordered the City Engineer to prepare plans and estimates for an overhead bridge over the Erie Canal at Van Rensselaer St.

TROY, N. Y.—A bill has been introduced in the Legislature by which the United Traction Co. of Albany is empowered to build a draw bridge over the Hudson River from Broadway, Troy, to a point on the southerly end of Centre Island in the Hudson River, and thence to a point on Broadway in the city of Watervliet, at or near Twenty-fifth St.

UKIAH, CAL.—The question of a bridge over the Garcia River near Point Arena will probably come up again in April. Hale McCowen, County Clerk.

WATERFORD, N. Y.—It is proposed by the terms of a Senate bill to appropriate $10,000 for a new steel plate girder bridge over the Champlain Canal at Fulton St., in the village of Waterford.

WILKESBARRE, PA.—Bids will be received until noon, Feb. 24, by H. H. Willis, Secretary, 33 Coal Exchange, Wilkesbarre, Pa., for two stone arch bridges and a double track railroad bridge over the pond holes between Wilkesbarre and Kingston. Plans, specifications and blank bids can be seen at the office of H. S. Smith, Engineer, 79 Coal Exchange, Wilkesbarre, Pa. (Nov. 17, 1899, p. 798.)

WOODLANDS, ONT.—Tenders are invited by E. P. Langrell, Clerk of Bridge Committee, for building a bridge over the arm of Long Lake.

Other Structures.

BOSTON, MASS.—The Fitchburg RR., according to report, proposes to build a new wharf to add to its docks in Charlestown. A bill for this privilege will shortly be introduced in the Legislature.

BUFFALO, N. Y.—Reports state that surveyors are at work on the site of the large steel plant which is to be built at Stony Point, and also that bids for buildings will soon be asked.

The Lehigh Valley RR. Co. has made application to the State Land Board for a grant of 226.3 acres of land under the waters of Buffalo Harbor upon which it is proposed to build bulkheads, piers and warehouses.

In the New York Assembly Jan. 30, Mr. Hill's Pan-American Exposition bill authorizing a State building at a cost of $100,000 was passed. When the Exposition is over, this building will become the property of the Buffalo Historical Society.

CHATTANOOGA, TENN.—The shops of the Cincinnati, New Orleans & Texas Pacific in this city will be enlarged.

COLORADO SPRINGS, COLO.—Reports state that the Colorado Springs & Cripple Creek Ry. has secured a site for the proposed new station.

FRANKLIN, PA.—Plans are being prepared by the Franklin Steel Casting Co. to double the present capacity.

JOLIET, ILL.—The Pressed Steel Car Co. is arranging to enlarge its plant at Joliet.

KNOXVILLE, TENN.—We are told that the Southern Ry. Co. has not yet decided on the plans for the proposed new station at Knoxville.

MEMPHIS, TENN.—Reports state that a new union station will be built in Memphis.

MINNEAPOLIS, MINN.—It is reported that work on the terminals of the Wisconsin Central will shortly be begun. A new freight house and roundhouse will be built.

MONESSEN, PA.—The Pittsburgh & Lake Erie has decided to build a new passenger and freight station at Monessen in the spring.

PERTH AMBOY, N. J.—The Lehigh Valley's grain elevator at this place was destroyed by fire on Jan. 28.

PHILADELPHIA.—Competitive plans will soon be wanted on the armory building for the First City Troop, which is proposed at an approximate cost of $250,000.

PITTSBURGH, PA.—Five new passenger stations are to be built by the Pittsburgh & Lake Erie RR., according to report, along the Monongahela Division.

We are told that the new Pittsburgh Station of the Pennsylvania is not under contract. The plans will not be completed until about the first of April. Negotiations for land purchases are now going on.

RICHMOND, IND.—We are told that while it is true that the Pittsburgh, Cincinnati, Chicago & St. Louis has had some negotiations with the city in connection with remodeling the present station at Richmond, no definite details have been decide.

SEATTLE, WASH.—Some time ago we mentioned the fact that the Northern Pacific proposed to build a large passenger station in Seattle. President Hill of the Great Northern now presents to the City Council elaborate plans for a handsome depot, freight shed, etc. He announces that he is ready to build as soon as the city shall approve his plans. The Northern Pacific is offered a share in the depot building and other facilities, making it a grand union station to cost between $300,000 and $500,000. The general plan of the proposed Great Northern depot building is like that of the B. & O. depot at Baltimore, Md. It will be of brick and stone, 365 ft. frontage on Occidental Ave. and 75 ft. deep, two stories high. The train sheds will be 450 ft. long by 70 ft. wide.

SWISSVALE, PA.—The Union Switch & Signal Co., Jan. 22, let contracts for the new plant at Swissvale to James Stewart & Co. of St. Louis, Mo., and the Shiffler Bridge Co. of Pittsburgh for a sum approximating $350,000. The machinery for the new works will be taken from the old plant and from the abandoned plant of the National Switch & Signal Co. at Easton. The present plant of the Union Switch & Signal Co. will be kept in operation until the new plant is finished. The new plant will be a two-story brick, stone and steel building, 564 ft. long and over 300 ft. wide, on the line of the Pennsylvania RR.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xii.)

Central Railway Club.

At the meeting of the Club, held January 12, at Buffalo, the committee appointed to carry out the recommendations of the club pertaining to a gift of $300 to the Brooks Memorial Hospital, of Dunkirk, N. Y., reported that the instructions were fully complied with and that the Board of Directors of the hospital adopted a resolution thanking the club for the gift.

American Society of Mechanical Engineers.

The fourth junior meeting of the winter will take place at the house of the Society, 12 West Thirty-first St., New York City, on Tuesday, February 6, at 8:15 P. M. Mr. W. W. Bird, Treasurer of the Broadway Iron Foundry, will present a paper on "The Uses and Relative Values of Steel, Gun and Gray Iron Castings," illustrating his remarks with a few lantern slides. After the paper it is expected there will be an interesting discussion.

The Mechanical Conventions.

The United States Hotel, at Saratoga Springs, will be opened in time to accommodate those attending the Master Car Builders' and Master Mechanics' Conventions. Special rates of $5 a day and of $5 additional to those desiring a parlor and bath will be made. The United States Hotel is near the headquarters and is just across the street from the place of meeting. It is expected that a considerable number of the members of the convention will locate at the United States. Rooms are now being booked.

American Institute of Electrical Engineers.

Last week we reported briefly the 139th meeting of the Institute, held on Wednesday evening, Jan. 24. At a meeting of the Council in the afternoon of that day it was voted to hold the next general meeting of the Institute in Philadelphia. The date of this meeting has not been fixed. Over 60 members have promised to attend the meeting in Paris, beginning Aug. 16. An appropriation of $500 was voted for providing a suitable place to file the periodicals received at the Institute rooms and for binding the same.

Canadian Society of Civil Engineers.

The Fourteenth Annual Meeting for the election of the Council for 1900, and for the transaction of other business, was held beginning Wednesday, January 31, at 112 Mansfield Street, Montreal, Que. At 9 p. m., that day, a special train, provided by the courtesy of the Grand Trunk, the Central Vermont and the Boston & Maine railroads, and the Pullman Company, left Bonaventure Station for Boston, Mass. The visiting members of the society on Thursday, Friday and a portion of Saturday will visit many works of engineering interest in Boston and its neighborhood, under the direction of the Boston Society of Civil Engineers.

International Mining Congress.

The third annual session of the International Mining Congress will meet at 10 A. M. Tuesday, June 19, at Milwaukee, Mich., and sessions will be held every day that week. An effort is being made to promote the interests of mining among all classes of people, and it is not the object of this Congress to confine its consideration alone to that of gold, silver and their bi-products, but the subjects of iron, coal, marble, stone, various fireclays, asphaltum, etc., will be discussed. It is also hoped that this Congress will bring about needed changes in the Federal mining laws, and also secure better recognition of the mining industry in the National Government. Further information may be obtained from the Secretary of the Local Executive Committee, Mr. T. J. Sullivan, Sentinel Building, Milwaukee, Wis.

The Engineers' Club of Philadelphia.

A regular meeting of the club will be held on Saturday, February 3, at 8 o'clock p. m., at which time a paper on The Utilization of Bacteria and Bacteriological Methods in Modern Sanitary Engineering will be presented by Prof. A. C. Abbott.

At the election held Jan. 20, 211 legal votes were cast. The following officers were elected: President, Edgar Marburg; Vice-President, L. Y. Schermerhorn; Secretary, L. F. Rondinella; Treasurer, Geo. T. Gwilliam; Directors (for two years), James Christie, Charles Piez, Edwin F. Smith.

After the election Professor Edgar Marburg gave a brief review of the past record of the club, and suggested some possibilities for the future. Dr. Coleman Sellers was elected to Honorary Membership.

American Society of Civil Engineers.

We have already recorded the principal doings at the annual meeting of the American Society of Civil Engineers. We failed, however, to note the fact that the Collingwood prize was awarded this year to Mr. Julius Kahn, Junior of the Society, for his paper entitled "The Coal Hoists of the Calumet & Hecla Mining Company." In our report of the meeting we stated that the Rowland prize was awarded to Mr. R. S. Buck, Member, for his paper on "The Niagara Railway Arch," and the Norman medal to Mr. E. Herbert Stone, member, for his paper on "The Determination of the Safe Working Stresses of Railway Bridges of Wrought Iron and Steel."

At the annual meeting a resolution was passed accepting the final report of the Committee on Standard Time with the thanks of the Society to Mr. Fleming and to the members of the Committee for their long continued service.

In the January issue of the Proceedings the principal paper is by Mr. Charles S. Gowen, member, on "The Foundations of the New Croton Dam." This is a paper of 75 pages with numerous illustrations and is another one of the fine papers which have lately appeared in the Proceedings and Transactions of the Society.

American Institute of Mining Engineers.

We have already announced that the 78th meeting of the Institute will be held in Washington, D. C., beginning Tuesday, Feb. 20. Mr. E. W. Parker, of the U. S. Geological Survey, is Secretary of the Local Committee. The hotel headquarters will be at the Arlington Hotel. The following is an abstract of the programme:

Tuesday Evening, February 20.—Informal gathering at 7 p. m. and opening session at 8 p. m.; address by Director Walcott on "The Work of the United States Geological Survey in Relation to the Mineral Resources and Mining Industries of the United States," Mr. G. K. Gilbert, of the Survey, will exhibit a series of lantern views of Alaskan scenery.

Wednesday, Thursday and Friday. — Sessions Wednesday and Thursday morning and Friday morning and afternoon. Wednesday afternoon, optional local visits. Wednesday evening, the Institute party will be the guests of the Washington Academy of Science at a private view of the art collection in the new Corcoran Gallery of Art. Thursday afternoon, excursion to Mt. Vernon, or alternative excursion to Cabin John Bridge. Thursday evening, an informal reception at the new Congressional Library.

Friday Evening, February 23, a subscription banquet at the Arlington Hotel.

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. C. E. Harmon, General Passenger Agent of the Western & Atlantic (Nashville, Chattanooga & St. Louis), is seriously ill at his home in Atlanta, Ga.

—The wife of Mr. W. M. Newbold, Division Superintendent of the Louisville & Nashville at Birmingham, Ala., died Jan. 18.

—Mr. Van Norman McGee, Acting Assistant Engineer of the Southern Pacific, has been appointed Professor of Civil Engineering in the Imperial University at Tientsin, China. Mr. McGee is a graduate of Stanford University.

—Mr. W. T. Lambie, C. E., was killed by accident while on duty as Inspector of Tunnels for the city of Los Angeles, Cal., on Jan. 21. He was formerly City Engineer of Los Angeles, and had served as Major of Engineers in the Confederate Army. He was at one time Constructing Engineer of the Southern Pacific and was connected with many hydraulic works.

—Mr. Philip D. Armour, Jr., died suddenly at Santa Barbara, Cal., on Jan. 26. Mr. Armour went to California early in January and was in his usual health until about 24 hours before his death. Mr. Armour was born in Milwaukee 31 years ago and was the second son of Philip D. Armour. When he became of age he was admitted as a member into the firm of Armour & Co.

—Mr. George S. Greene, Jr., and his son, Mr. Carleton Greene, have formed a partnership under the title of Greene & Greene, with offices at 11 Broadway, New York City. They offer their services as consulting engineers in general practice. Mr. George S. Greene, Jr., was for about 25 years Chief Engineer of the Department of Docks, New York City, and has a world-wide reputation in his special line of work. Mr. Carleton Greene was recently Superintendent of Machinery of the Barber Asphalt Paving Company.

—Mr. John Hornby, President of the Fort Worth & Rio Grande Railway, died suddenly Jan. 27 of pneumonia. He was born at Jamaica, N. Y., in 1838, and began his railroad career in 1866 as Freight Check Clerk on the Union Pacific. Mr. Hornby had been connected with various roads as Acting Master Mechanics, Division Superintendent, Master of Transportation, Land Commissioner and General Manager. In 1888 he became General Superintendent and General Freight and Passenger Agent of the Fort Worth & Rio Grande, finally becoming its President.

—The new Pere Marquette System has as its General Manager Mr. S. T. Crapo, who comes from a like position with the Flint & Pere Marquette, which forms a part of the system. Mr. Crapo was born at New Bedford, Mass., in 1865. He was graduated from Yale College in 1886. He entered railroad service in 1887 with the Flint & Pere Marquette in the local freight office at Saginaw, Mich., and has continued with that company until the present time. He was made Division Superintendent in 1889; Assistant to the General Manager in 1891; Acting General Manager in 1894 and General Manager the same year.

—Mr. S. W. Hayes, who on Feb. 1 becomes Division Engineer of the Western Division of the New York Central & Hudson River at Buffalo, N. Y., was born at Granville, O., Oct. 9, 1865, and was graduated at Cornell in 1891. Some time before graduating he had been telegraph operator on the Pittsburgh, Cincinnati & St. Louis, station agent of the Connotton Valley, transitman on the Jeffersonville, Madison & Indianapolis and transitman, topographer and Assistant Engineer on the Northern Pacific. For two years following 1891 he was Assistant Engineer of the Cleveland, Cincinnati, Chicago & St. Louis. He was then made Engineer of Maintenance of Way of the Cleveland-Indianapolis Division of the same road, the position he held at the time of his recent change.

—Mr. J. A. Anderson, whose recent retirement from the head of the Pennsylvania Railroad Voluntary Relief Department was noted in the Railroad Gazette of January 5, was the recipient, on Tuesday of last week, of a handsome leather-bound book containing a set of resolutions which had been passed by the subordinate officers and the employes of Mr. Anderson's late office. The resolutions were engrossed in artistic pen work and embellished with four pen sketches of railroad scenes. A presentation committee, of which Mr. M. Homer was the chairman, visited Mr. Anderson at his home in Lambertville and gave him the testimonial. The language of the resolutions, expressing esteem and affection, gives evidence that the signers of the document cherish these feelings toward Mr. Anderson to a degree quite unusual in such relations.

—After 53 years of service, Mr. Joseph M. Coale, Master Mechanic of the Baltimore shops of the Northern Central Ry. Co., earns an honored retirement. He was born Jan. 4, 1830, in Baltimore County, Md. He entered railroad service in December, 1846, as machinist's apprentice in Baltimore at the Bolton shop of the Baltimore & Susquehanna, now a part of the Northern Central. He continued with that company until October, 1852, when he went to the Island of Cuba as a locomotive engineer. Three years later he re-entered the service of the Northern Central as Locomotive Engineer and Machinist. He was made Assistant Master Mechanic in 1860 and Master Mechanic in 1875. Mr. Coale is the inventor of the Coale muffled pop valve which is used as a standard on the locomotives of the leading railroad systems of the United States and Europe.

—Mr. Melville E. Ingalls left the presidency of the Chesapeake & Ohio Feb. 1, but continues President of the Cleveland, Cincinnati, Chicago & St. Louis. Mr. Ingalls was born in Harrison, Me., in 1842, and began work as a country schoolmaster at the age of 16. He entered Bowdoin College in 1860, went to the Harvard Law School in 1862, and began the practice of law in 1864. He became a successful and prominent corporation lawyer and in 1871 went to Cincinnati as Receiver of the Indianapolis, Cincinnati & Louisville Railway. In 1880 he became President of the reorganized company, the Cincinnati, St. Louis & Chicago, which in 1889 was consolidated with the Cleveland, Columbus, Cincinnnati & Indianapolis and the Indianapolis & St. Louis, of which company Mr. Ingalls has been President ever since. He has been President of the Chesapeake & Ohio also since 1888.

—Mr. John McLeod, Receiver of the Kentucky & Indiana Bridge Company, and a well known Civil Engineer, died at his home in Louisville, Ky., Jan. 21. He was born in 1838 in Maryland and entered the railroad service as rodman on the Fredericksburg & Gordonsville. In 1855 Mr. McLeod assisted his father in the construction of the Louisville & Nashville RR. In 1880 he became General Superintendent of the Louisville, New Albany & Chicago (Chicago, Indianapolis & Louisville). One year later he was appointed Chief Engineer of the Kentucky & Indiana Bridge Company and was Consulting Engineer of the same company from 1887 to 1893, when he became Receiver. He was also Receiver of the Ohio Valley Railway, and of the New Albany Electric Railway. Mr. McLeod became a Member of the American Society of Civil Engineers in 1872, and was Vice-President in 1892.

—The new Engineer Maintenance of Way of the Chicago & Alton, Mr. F. G. Jonah, was born at Moncton, N. B., Oct. 6, 1864. He entered the Chief Engineer's office of the Intercolonial Ry. in May, 1882. He was at first assigned to office duties, but subsequently acted as chainman, rodman, etc., on surveys of various branch lines. He served in the Maintenance Department until September, 1887, when he was made Assistant Engineer in charge of construction of a division of the Oxford & New Glasgow, a branch of the Government system in Nova Scotia. Upon the completion of this work in September, 1889, he re-entered the Maintenance Department of the Intercolonial. He became Assistant Engineer of the Merchants' Bridge & Terminal Ry. in St. Louis in April, 1890, and held that position until March, 1894, when he became Resident Engineer on the St. Louis & Eastern, now the St. Louis, Peoria & Northern. He had charge of building that line between Springfield and Peoria. On the recent absorption of the line by the Illinois Central and the Chicago & Alton, he was transferred to the latter road.

—Mr. Walter G. Berg has been appointed Chief Engineer of the Lehigh Valley Railroad, with office at South Bethlehem, Pa. Mr. Berg has been an active and enterprising engineer and is widely known in the profession. He was born in New York Jan. 12, 1858, and began engineering work in 1879, as office assistant and shop inspector of railroad bridges with the Delaware Bridge Company. He served as bridge inspector and later as Engineer of Bridges and Buildings on the Richmond & Allegheny Railroad, then as Engineer in charge of that railroad, then as Principal Assistant Engineer of the East Tennessee, Virginia & Georgia and for a number of years has been on the Lehigh Valley as Engineer, as Superintendent of the Lehigh Valley Creosoting Co., as Principal Assistant Engineer and as Engineer of Maintenance of Way. Mr. Berg is the author of the book on "American Railway Bridges and Buildings," many chapters of which were published in the Railroad Gazette before it was published in book form by Wiley. He has served as President of the Association of Superintendents of Bridges and Buildings and was active in the organization of that Association. He became a member of the American Society of Civil Engineers in 1896.

—Mr. George W. Stevens succeeds Mr. Ingalls as President of the Chesapeake & Ohio Railway, to take effect Feb. 1, an outcome of Mr. Ingalls' resignation which we have foreseen for some time. Mr. Stevens was born June 29, 1851, in Utica, O., and entered railroad service Feb. 1, 1864, on the Baltimore & Ohio. He rose gradually to be Train Dispatcher on the Pittsburgh, Cincinnati & St. Louis and in 1873 went to the Wabash, where he was Train Dispatcher, Division Superintendent and Assistant General Superintendent until Jan. 1, 1890, when he went to the Chesapeake & Ohio as General Superintendent. July 1, 1891, he was made General Manager of that road. It will be seen that Mr. Stevens' career has been the familiar career of so many officers of the railroads who have risen from the humblest positions through the telegraph office to high places. Mr. Stevens believes in managing the property from "out on the road," and has a familiarity with the details of the road and of train movement which is rare even among officers bred as he has been. The rapid development of the Chesapeake & Ohio under the administration of Mr. Ingalls and Mr. Stevens is too well known to call for comment now. It has taken its place among the substantial, well equipped and well operated lines reaching the Atlantic seaboard. As Mr. Stevens is still under 50 and a man of uncommonly vigorous mind and body, it is reasonable to believe that his railroad career has only fairly begun.

ELECTIONS AND APPOINTMENTS.

Arizona & Southeastern.—Walter Douglas has been appointed Resident Managing Director.

Atchison, Topeka & Santa Fe.—R. J. Parker has been appointed Superintendent of the Western Division, succeeding Charles Dyer, resigned. F. T. Dolan succeeds Mr. Parker as Superintendent of the Middle Division. D. D. Bailey succeeds Mr. Dolan as Superintendent of the Oklahoma Division, and H. A. Tice succeeds Mr. Bailey as Superintendent of the Pan Handle Division. Effective Feb. 1.

The appointment of Mr. R. P. C. Sanderson to the motive power department, already noticed, will take effect Feb. 1. His title will be Assistant Superintendent Motive Power.

Buffalo, Rochester & Pittsburgh.—J. C. Hyde has been appointed Acting Superintendent at Butler, Pa.

Canada Atlantic.—J. E. Duval has been appointed Car Service Agent at Ottawa, Ont. In addition to the regular duties of Car Service Agent, Mr. Duval will have charge of the car mileage accounts, formerly looked after by the General Auditor, and will also receive the four o'clock car report, and direct the distribution of cars. Effective Feb. 1.

Chesapeake & Ohio.—G. W. Stevens, General Manager, has been elected President to succeed M. E. Ingalls.

Chicago Junction.—Chas. D. Moyer has been appointed Treasurer, with headquarters in Exchange Building, Union Stock Yards, succeeding J. C. Denison, resigned, effective Jan. 18. J. A. Spoor, President.

Chicago, Milwaukee & St. Paul.—J. C. Miller has been appointed to succeed F. W. Delbert as Division Master Mechanic, with headquarters at W. Milwaukee, Wis.

Eastern Nebraska & Gulf.—At a recent meeting the following directors were elected: W. C. McNamara, J. B. Keefe and H. A. Jandt, Sioux City; F. W. Kimball, Austin, Minn.; C. J. O'Connor and Thomas Ashford, Jr., Homer, Neb.; D. A. Holmes, Chicago. W. C. McNamara of Sioux City was elected President, and J. B. Keefe, Secretary and Treasurer.

Galveston, Houston & Northern.—The officers of this company, whose property has passed under the control of the Southern Pacific, are: President, C. P. Huntington; Vice-President, W. G. Van Vleck; Auditor and Secretary, C. B. Segar, and Treasurer, B. C. Cushman. The Directors, including those above mentioned, except Mr. Cushman, are T. W. House, W. B. Chew, Jos. F. Meyer, J. M. Dorrence, Sam E. Allen and J. T. Mahl. (See Railroad News column.)

Gulf, Beaumont & Kansas City.—F. M. Aldridge, General Superintendent at Beaumont, Tex., has resigned.

Lehigh Valley.—Walter G. Berg has been appointed Chief Engineer, with headquarters at South Bethlehem, Pa. E. B. Ashby succeeds Mr. Berg as Engineer Maintenance of Way, and the office of Assistant Engineer Maintenance of Way is abolished.

Milford, Matamoras & New York.—The Directors of this company are: P. Q. Deyo, W. S. Banta, A. B. Porter, Joseph H. Thompson, Jr., and E. B. Childs of New York; Ellis M. Lewis, Charles M. Clark and A. T. Seeley of Milford; Warren K. Ridgway of Matamoras; E. Monthemont of New York; Nicholas W. Holden and James Holden of Dark Swamp; John G. Hilliard was elected President. (See RR. Construction column. May 5, 1899, p. 323.)

Missouri Pacific.—M. Stilwell has been appointed Division Superintendent of the St. Louis and Sedalia Sections of the Eastern division, and tributary branches, succeeding W. G. Brownlee, resigned. I. H. Luke has been appointed Division Superintendent of the Kansas City section of the Eastern division, Levington Branch and J. C.. B. & L. division, succeeding Mr. Stilwell. A. DeBernardi succeeds Mr. Luke as Division Superintendent of the Central Branch Railway, Rooks County Railroad and Pacific Railway in Nebraska. Effective Feb. 1.

New Orleans & Western.—Chas. W. Towsley has been appointed Superintendent of the N. O. & W.. and the Port Chalmette Terminal, succeeding R. B. Fowler.

New York Central & Hudson River.—D. O. Mills was elected a Director, succeeding H. J. Hayden, at a meeting of the stockholders, held Jan. 24.

Northern Central (Pennsylvania).—R. K. Reading, heretofore Master Mechanic at Sunbury, Pa., of the Pennsylvania, will on Feb. 1 take charge of the N. C. shops at Baltimore, Md.. succeeding J. M. Coale, Master Mechanic, retired.

Pittsburgh & Lake Erie.—John G. Robinson, Secretary and Treasurer of the P. & L. E., and the Pittsburgh, McKeesport & Youghiogheny, a subordinate line of the P. & L. E., has been elected a Director of both companies, to succeed Cornelius Vanderbilt.

Plant System.—Press dispatches say that W. B. Denham, Superintendent, at Gainesville, Fla., would succeed B. Dunham as General Superintendent about Feb. 1.

Pullman Company.—J. C. Yager, heretofore General Manager of the Wagner Palace Car Co., has been appointed Assistant General Superintendent of the P. C. Mr. Yager's headquarters will remain at Forty-fourth St. and Vanderbilt Ave.

Southern.—The following changes have been made among the Supervisors of Bridges and Buildings; W. R. Woodward succeeds A. D. Sams (p. 63) at Asheville, N. C. A. Bruner succeeds Mr. Woodward at Charlotte, N. C., and M. L. Dillard succeeds Mr. Bruner at Charleston. Effective Jan. 10.

Southern Pacific.—D. O. Mills has been elected a Director.

RAILROAD CONSTRUCTION.
New Incorporations, Surveys, Etc.

ALABAMA ROADS.—The Republic Iron & Steel Co. is reported to have let a contract for grading a railroad from Thomas to its new mines at Warren near Birmingham, Ala.

ARIZONA ROADS.—The owners of the Ray copper mines situated on Mineral Creek in Pinal County, are reported building a railroad six miles long from the mines to the smelter. Grading is completed and rails are arriving.

BARCLAY.—See Bradford Central.

BELLINGHAM BAY & BRITISH COLUMBIA.—Amended articles of incorporation have been filed in Washington for the proposed extension from Sumas southeast 24 miles through the County of Whatcom to Comells. Contracts are to be let soon for the work. (Dec. 22, 1899, p. 888.)

BRADFORD CENTRAL.—The annual meeting recently held developed the fact of the close connection between this line and the Buffalo & Susquehanna. It is proposed to build a line from Ansonia, Pa., on the B. & S., to run east to Canton on the Northern Central line of the Pennsylvania, there to connect with a western extension of the Barclay line, which in turn, it is said, is to be extended further eastward to the Delaware & Hudson.

BRITISH COLUMBIA ROADS.—S. C. Briggs of Toronto, Ont., is applying to the Dominion Government to incorporate a company to build from a point at or near Carson City, B. C., where the Kettle River intersects the boundary line, to run north via the Fourth of July Creek to a point near the junction of the east and west forks of the Kettle River and thence west to Phoenix Camp; also a branch from the same point east to a point on the Columbia & Western line of the C. P. R. near Grand Forks; also a branch to the Central, Whites, Wellington, Skylark and Summit mining camps and to the city of Greenwood.

CALIFORNIA ROADS.—It is reported that Holt & Gregg are building a spur at Kennet which is nearly ready for the rails.

CANADIAN PACIFIC.—The following extensions have been arranged in Manitoba to be built as soon as the formal approval of Parliament is obtained. The company already has a right to build under a special clause in their charter.

From Osborne southwest to Manitou or Morden.

From Osborne west to Carman and thence to a point between Cartwright and Boissevain.

From a point between Lander and Monteith east to Glenboro or Treesbank.

From West Selkirk to Lake Winnipeg and thence to the Saskatchewan River.

From Deloraine southwest and west 100 miles through Waskeda.

From a point between Maniton and Pilot Mound to the boundary, with a branch east 50 miles, another west 50 miles and another from Macgregor west about 50 miles to Varcoe.

From Malson north to Lac du Bonnet or Winnipeg River.

From near Napinka west 50 miles.

From Otterburn southeast to a point in Townships 1, 2 or 3.

From Morden to Miami and thence to Carman.

From Hartney or Souris to Boissevain or Uruga.

CHARLESTON, CLENDENNIN & SUTTON.—Grading is reported in progress on the extension from Clay C. H., W. Va., northeast 50 miles to Sutton. (Oct. 2, 1898, p. 786.)

CHICAGO GREAT WESTERN.—With reference to improvements on his line, the General Manager writes that the company has expended a million or two on improvements and additions each year since 1895, and expects to do so this coming year. (Jan. 19, p. 47.)

CHICAGO, MILWAUKEE & ST. PAUL.—The company is relaying a 24-mile stretch of track on the Sioux City & Dakota division in the vicinity of Grant City, Ia., with 75-lb. rails.

CHICAGO, ROCK ISLAND & PACIFIC.—The General Manager writes that, so far as his information goes, it is not true that an extension is to be made from Ruthven, Ia., northwest about 25 miles to Spirit Lake, as reported. (Jan. 26, p. 63.)

COLORADO SOUTHERN.—Extensive improvements are to be made for this line, according to report, involving an expenditure of $500,000.

COPPER RANGE.—Rails have been received at Houghton, Mich., according to report, for the proposed extension from Houghton north 15 miles to Calumet. Negotiations are under way with the Duluth, South Shore & Atlantic for the use of the railroad bridge across Portage Lake. Surveys are now in progress. (Nov. 24, 1899, p. 819.)

DELAWARE, LACKAWANNA & WESTERN.—Two branch tracks are to be built, according to report, to the new cement plant at Stewartsville, N. J.

DES MOINES, IOWA FALLS & NORTHERN.—The directors have decided to make another survey for this proposed line between Des Moines, Ia., and Iowa Falls. President Ellsworth has telegraphed from New York that complete arrangements were made for financing the road. L. M. Cummings of

the Chicago Loan & Trust Co. is interested. (Dec. 15, 1899, p. 871.)

EASTERN NEBRASKA & GULF.—Plans are completed, according to report, for building this line from Sioux City, Ia., south through Nebraska, 97 miles to Omaha. The officers and directors are given under Elections and Appointments.

EVERETT & MONTE CRISTO.—Work is begun, according to report, to rebuild this line, which was destroyed some years ago by floods. The line extends from Everett Junction, Wash., to Snohomish, 11.5 miles, and from Hartford Junction to Monte Cristo, 42.39 miles, with 82 miles of trackage from Snohomish to Hartford Junction on the Seattle & International.

FAIRPORT & YOUNGSTOWN.—This company was incorporated Jan. 23, with a capital stock of $30,000, to build a railroad from the lake town of Fairport, O., to run southeast 30 miles to a point one mile north of Eagleville, Ashtabula County, on the Pittsburgh, Ashtabula & Youngstown line of the Pennsylvania Company, which is supposed to be back of the project. It is stated that John D. Rockefeller will build a steel plant at Fairport. The incorporators are: James McCrea, L. L. Gilbert, John Renner, Reuben F. Smith and Charles T. Brooks.

GRAND TRUNK.—An officer writes that nothing has been settled with reference to the proposed spur westward from Waterdown Station near Hamilton, Ont. (Jan. 12, p. 29.)

GURLEY & PAINT ROCK VALLEY.—Frank B. Gurley, President of the company, is reported securing options upon 100,000 acres of timber land for this proposed line from Gurley, Ala., north up Paint Rock Valley to Winchester, Tenn. Surveys were made some time ago. (April 21, 1899, p. 289.)

IDAHO ROADS.—The city of Coeur d'Alene has granted an ordinance to Wm. Dollar to build a railroad track from the Northern Pacific on Third St., east to Sixth St., to a sawmill.

KANSAS MIDLAND.—A dispatch from Wichita, Kan., states that the directors have authorized the proposed extension of this line from Wichita, Kan., south via Pawnee, Okla., and McAlester, I. T., to Denison, Tex. Surveys were made last year. (July 21, 1899, p. 531.)

KANSAS, PERRY & PORT ARTHUR.—This company has been incorporated at Oklahoma, with a capital stock of $1,000,000, to build a railroad from Perry north about 100 miles to Wichita, Kan.; also from Perry northeast to Elgin, Kan., and from Perry southeast to Stroud, in all about 170 miles. The directors are: R. W. Southard, C. E. Van Cleef, F. G. Moore, Thomas H. Doyle, Sam B. Wadsworth, Ethan Allen, M. Burke, J. H. Bullen, J. B. Tate, W. W. Faulds, James Lobsitz, all of the City of Perry.

KINGSTON & PEMBROKE.—Surveys are reported in progress in the vicinity of Bryson, Que., for the proposed extension from Renfrew, Ont., across the Ottawa River to that city. (Jan. 19, p. 48.)

LEHIGH VALLEY.—John F. Dolan is reported to have the contract for building about a mile of fourth track near Glen Onoko, Pa. (Oct. 20, 1899, p. 736.)

LINDSAY, BOBCAYGEON & PONTYPOOL.—The towns of Lindsay, Bobcaygeon and Veruluni have granted subsidies aggregating $50,000 for this proposed line to connect the three cities named in the title. W. C. T. Boyd of Bobcaygeon, and W. J. Weekham of Ontario are interested. (July 7, 1899, p. 499.)

LOUISVILLE & NASHVILLE.—Contracts are to be let soon, according to report, for a branch of the Alabama & Florida line, which now runs from the main line at Georgiana, Ala., southeast 33 miles to Andalusia. The extension is to be from Andalusia southeast 45 miles to Geneva.

MANITOULIN & NORTH SHORE. — Messrs. Hearst & Mackay of Sault Ste. Marie, Ont., are applying to the Ontario Legislature to incorporate this company to build from Little Current to a point at or near Sudbury on the C. P. R.; also from the same point to James Bay; also from the same point southeast to a point on the south shore of Manitoulin Island; also from Tobermory, Bruce County, south and southeast to Meaford, Grey County.

MINERAL.—Messrs. Blake, Lash & Cassells of Toronto, Ont., are applying to the Ontario Legislature for permission to build a line from Gros Cop Harbor on the north shore of Lake Superior, to run northeast to a point on the C. P. R.

MISCELLANEOUS COMPANIES.—The Eastern & Southern Construction Co. has been organized at Portland, Me., with a capital stock of $250,000, to build railroads, etc. A. J. Desmond of Portland is President, and H. P. Sweetser of Portland, Treasurer.

MUSCATINE, TIPTON & NORTHERN.—This company was incorporated in Iowa Jan. 26, with a capital stock of $150,000, to build its proposed line from Muscatine northwest about 100 miles via Tipton to Independence, junction of the Illinois Central and the Burlington, Cedar Rapids & Northern. Milton Weston is President, and E. L. Toble, Vice-President. T. B. Downer of Muscatine is Engineer in charge of surveys. (Jan. 26, p. 64.)

NORTHERN PACIFIC.—Recent floods have destroyed much of the line between Vollmer, Id., and Julietta, and the company has a large force of men at work to repair the damage.

NORTHWESTERN, TAHLEQUAH & OKLAHOMA.—Press reports state that a line under this title is being built from Fayetteville, Ark., on the St. Louis & San Francisco, west about 50 miles to Tahlequah, I. T. It passes through rich lead, zinc and coal fields.

OKLAHOMA CITY & WESTERN.—C. G. Jones of Oklahoma City, President, is reported completing details for building a railroad from Oklahoma City southwest 178 miles to Acme, Tex., said to be in the interest of the St. Louis & San Francisco.

OMAHA NORTHERN.—A. S. Churchill of Omaha, Neb., President, is reported as stating that the contract has been let for grading this line and most of the right of way is purchased from Sioux City, Ia., south about 92 miles to Omaha, Neb. (Dec. 1, 1899, p. 836.)

ONTARIO ROADS.—S. C. Briggs of Toronto, Ont., is applying to the Ontario Legislature for a charter for a line from near Rossport in the Thunder Bay District on the north shore of Lake Superior, to run northeast to a point on James Bay near the mouth of the Albany River, and with branches south of that river.

OREGON RAILROAD & NAVIGATION.—It is reported at Sumpter, Ore., that the company will build a broad gage line from Baker City west 15 miles to that place, and that work will be begun at an early date.

PENNSYLVANIA.—Work is begun on widening the 100-ft. cut east of Larimer Station, Pa. Work is still in progress on the cut between Larimer cut and Shafton. The cut below Irwin will be completed in February.

QUINCY, CARROLLTON & ST. LOUIS.—Surveys are reported in progress for an extension east about 2½ miles to the St. Louis, Peoria & Northern line of the Illinois Central. This is to give entrance into Litchfield, Ill. The trains now run over the Jacksonville & St. Louis.

ST. LOUIS & SAN FRANCISCO.—Surveys are reported in progress for an extension from Sapulpa, I. T., south about 175 miles to Sherman, Tex. It is stated that building to be begun soon.

ST. LOUIS, PEORIA & NORTHERN.—A lease of the tracks of this road to the Chicago Terminal Transfer has been filed. The lease covers a period of 99 years from Jan. 1, and the annual rental is $105,600 for the first ten years, and $150,000 for the remaining period.

SHEFFIELD & TIONESTA.—Crage & Tench of 61 Terrace, Buffalo, N. Y., have taken the contract for building this line from Sheffield, Warren County, to Kellettville, Forest County, Pa., 23½ miles. The contractors, according to report, will put 500 men at work this winter. The company was incorporated Jan. 2. Truman D. Collins of Nebraska, Pa., is President. (Jan. 5, p. 14.)

TENNESSEE & ALABAMA MINERAL.—Grading is begun on this line from Lawrenceburg, Tenn., on the Louisville & Nashville, to run south about 30 miles to a point in Alabama near Tuscombia on the Southern. R. M. Quigley & Co. of St. Louis have the contract. (Dec. 22, 1899, p. 888.)

TENNESSEE ROADS.—The Dayton (Tenn.) Coal & Iron Co., according to report, is to begin soon to build a line from Chattanooga south about 15 miles to a point about one mile north of Lafayette, Ga.

UNION PACIFIC.—An extension will be built, according to report, from Diamondville, Wyo., on the Oregon Short Line, to run south about 50 miles through coal lands to a point on the U. P.

VANCOUVER & LULU ISLAND.—Director H. Abbott of Vancouver, B. C., is asking tenders for clearing the surveyed portions of this line between Fairview and the north arm of the Fraser River, preparatory to building the road. (Dec. 8, 1899, p. 854.)

VICTORIA & KINGWOOD.—This company has been incorporated in West Virginia to build a railroad from Hardman's to Reedsville. Among the incorporators are: A. H. Whitsett, of Whitsett, Pa.; Adele De Billier, Henry De Billier and T. J. Crogan, of Kingwood, W. Va.; D. P. Whitsett, of Shelbourne, Ind.

VIRGINIA - CAROLINA. — This company has bought the right of way of the Abingdon & Damascus and is to complete it. It was graded some years ago. The statement was incorrectly made last week that the purchase was by the Norfolk & Western. (N. & W., Jan. 26, p. 64.)

WABIGOON, MANITON & RAINY LAKE.—W. J. Clark of Toronto, Ont., is applying to the Toronto Legislature for a charter to build from the south end of Minnetakie Lake or Mine Center, in the Rainy River district of Ontario, and from a point on the Canadian Pacific between Dryden and Tache stations east of Maniton Lake, to a point on the Ontario & Rainy River line of the Canadian Northern between Fort Francis and Sturgeon Falls.

WASHINGTON & RICHMOND AIR LINE.—A bill has been introduced in the Virginia Legislature to incorporate this company as a part of the Seaboard Air Line. It is proposed to build a line parallel to the Richmond, Fredericksburg & Potomac from Richmond north to Washington, D. C. (S. A. L., Sept. 22, 1899, p. 668.)

GENERAL RAILROAD NEWS.

ALABAMA & VICKSBURG. (Q. & C.).—Sealed proposals will be received up to Feb. 15 for as many second mortgage bonds as will absorb $10,000.

BALTIMORE & OHIO.—Special Masters A. S. Dunham and Arthur L. Spamer have filed in the United States Circuit Court at Baltimore, Md., their final report on the indebtedness of the old company. This shows that all the old claims are paid except six, most of which are in litigation. (Jan. 19, p. 48.)

COLUMBUS, HOCKING VALLEY & TOLEDO.—Car trust bonds, series A, to the amount of $41,000, have been drawn for redemption at par and accrued interest at the Atlantic Trust Co., New York. (Nov. 3, 1899, p. 770.)

COPPER RANGE.—Arrangements are completed, according to report, for placing a mortgage of $20,000 a mile on the 40.9 miles of this line, recently completed from Range Junction, Mich., on the Chicago, Milwaukee & St. Paul northeast to Houghton. The bonds are to be 5 per cent., and the first issue will probably be $300,000. (Railroad Construction column, Jan. 12, p. 29.)

DETROIT & LIMA NORTHERN.—The receivers have filed an appeal from the order of the U. S. Circuit Court granting the payment of about $13,000 to the Wabash for the use of about eight miles of track between South Adrian, Mich., and Lima Junction. (Jan. 20, 1899, p. 55.)

FITCHBURG.—A new element has entered into the lease of this line in the offer of President Lucius Tuttle of the Boston & Maine to buy the 50,000 shares of common stock of the Fitchburg held by the State of Massachusetts in exchange for $5,000,000 of 50-year 3 per cent. gold bonds of the B. & M. A similar offer is made to the other minority stockholders. The condition is "that the lease of the property of the Fitchburg RR., as proposed, be ratified by the Legislature during the present session, and that such sale of the common stock be also ratified by the Legislature during its present session." The Governor and Executive Council have unanimously approved of the terms. (Jan. 26, p. 64.)

GALVESTON, HOUSTON & NORTHERN.—This road has been transferred to the control of the Southern Pacific. The new officers are given under Elections and Appointments. (Jan. 26, p. 64.)

GEORGETOWN & WESTERN.—This property is reported sold to a syndicate which controls the Atlantic Coast Lumber Co. of Georgetown, S. C. It is stated that the company has been reorganized with Charles R. Flint of New York as President. The line runs from Georgetown, S. C., to Lane's Depot, 36 miles.

GREAT NORTHERN.—The company announces that more than 75 per cent. of the holders of stock have subscribed for their share of the additional $9,000,000, and that the offer is now effective. Subscriptions are payable Feb. 28. (Jan. 12, p. 30.)

GREAT NORTHWEST CENTRAL.—The stockholders at a meeting at Toronto, Jan. 22, voted to lease this property to the Canadian Pacific. The application will come before the Minister of Railways & Canals at noon on March 3 next. (Dec. 29, 1899, p. 902.)

MOBILE & OHIO.—The Farmers' Loan & Trust Co., New York, asks proposals up to noon Feb. 5, to buy $75,000 of first preferred income and sinking fund debentures.

NORFOLK & WESTERN.—The company has sold $3,876,000 of first consolidated bonds to retire $3,488,300 of prior lien bonds which fall due at various dates up to July 1. The bonds are to be delivered as the new bonds fall due.

NORTHERN CENTRAL (PENNSYLVANIA RR.).—The $1,126,000 currency 6 per cent. bonds due April 1, and the $2,804,000 gold 6 per cent. bonds due July 1 will be paid at maturity and will be redeemed at par and accrued interest prior to that date. (April 14, 1899, p. 274.)

NORTHERN OHIO.—This property, which has been controlled by the Lake Erie & Western, has been transferred to the Lake Shore & Michigan Southern. It runs from Delphos, O., to Akron, 165 miles.

NORTHERN PACIFIC TERMINAL.—Twenty-one first mortgage 6 per cent. bonds of 1883 have been drawn for payment by the Farmers' Loan & Trust Co., New York, at 110 and accrued interest on Feb. 10.

OLD COLONY.—With reference to the proposed issue of $3,391,100 new stock, President Choate makes the following statement:

> Several million dollars have been spent on improvements since the lease, all of which was payable by the Old Colony. This includes the separation of grades at Brockton and on the Providence division. Now grades must be separated at Taunton; at Fall River, costing $800,000 or $900,000; at Middleboro, $120,000; at New Bedford and Attleboro. The new bridge at Tiverton will cost $200,000. The company has received nearly $1,000,000 from sale of land to the Terminal Company, and has other claims against it and against the Boston & Albany for land. The act of 1893 restricts expenditures from the proceeds of the new stock to Boston and Brockton, where the money is not needed. It is desired to remove this restriction. (Jan. 26, p. 64.)

QUINCY, CARROLLTON & ST. LOUIS.—This property was turned over to Dwight C. Morgan for the Chicago & Alton interests at midnight on Jan. 17. (Jan. 26, p. 64.)

ST. LOUIS, PEORIA & NORTHERN.—The Central Trust Co., New York, as mortgage trustee, on Jan. 25 filed a bill in the U. S. Circuit Court at Springfield, Ill., to foreclose the mortgage on the properties of this company and of the Madison Coal Co. The bonds, it is understood, are owned by the Chicago & Alton Syndicate, which desires a clear title. (Dec. 8, 1899, p. 854.)

SOUTH CAROLINA & GEORGIA.—N. G. Evans of Edgefield, S. C., on Jan. 25 introduced a bill into the South Carolina Legislature to annul the charter of this road and providing for its reorganization and sale. This is on the ground that the road has been acquired by the Southern, a competing road.

STUTTGART & ARKANSAS RIVER.—On account of the failure of Theodore C. Sherwood of Kansas City, the purchaser, to comply with the orders of the Court as to payment, Judge John A. Williams at Little Rock, Ark., has ordered the re-advertising of the property for sale at the upset price of $50,000, of which $10,000 is to be paid cash. Mr. Sherwood bought the property on Jan. 20, 1899, for $56,000. It runs from Stuttgart, Ark., to Gillett, 41 miles, and has been in the hands of the receiver since August 20, 1895. (Jan. 27, 1899, p. 75.)

TOLEDO, ST. LOUIS & KANSAS CITY.—In the U. S. Supreme Court on Jan. 29, the petitions for certiorari filed by this company against the Continental Trust Co. and others, were refused by the Court. The case involves the bonds of the railroad company and was decided in the court below favorably to the Trust Co. In the motion the Railroad Company sought to obtain a review by the Supreme Court, but this decision denies such review. The road is to be sold on April 2. (Jan. 26, p. 64.)

UNION PACIFIC.—Up to Jan. 20 this company had acquired $8,794,500 of the total $11,000,000 preferred stock of the Oregon Railroad & Navigation, and $6,615,700 of the $7,718,600 common stock, exclusive of the shares owned by the Oregon Short Line. The U. P. had also acquired $14,304,500 of the $14,841,000 Oregon Short Line B bonds. (Nov. 3, 1899, p. 770.)

UNITED VERDE & PACIFIC.—The property of this company and the United Verde Copper Co. was bought at auction on Jan. 9 for $500,000 by James A. Macdonald, representing the reorganization committee. The railroad runs from Jerome Junction, Ariz., to Jerome, 28.5 miles.

WACO & NORTHWESTERN.—The stockholders of the Houston & Texas Central on Jan. 19 decided to issue first mortgage bonds of the H. & T. C. not to exceed $25,000 per mile on the Waco & Northwestern, which passed into the hands of the parent company on June 30, 1898. (H. & T. C., Nov. 4, 1898, p. 806.)